United States
Department of
Agriculture

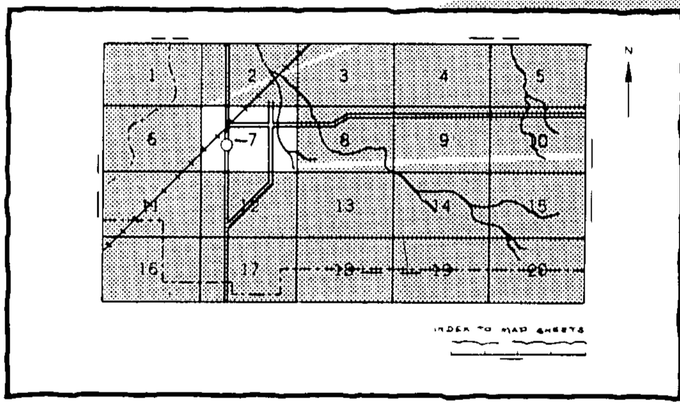
Soil
Conservation
Service

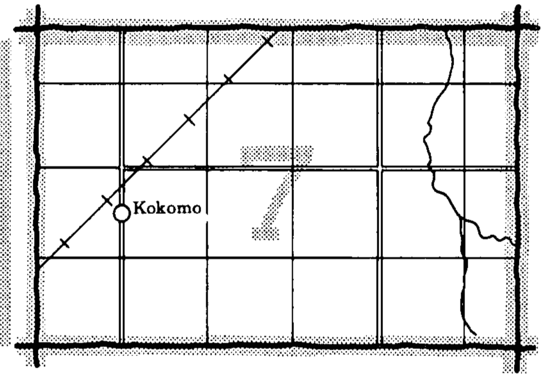
In Cooperation with
Purdue University
Agricultural
Experiment Station
and the
Indiana Department
of Natural Resources
Soil and Water
Conservation Committee

Soil Survey of Huntington County Indiana

HOW TO USE

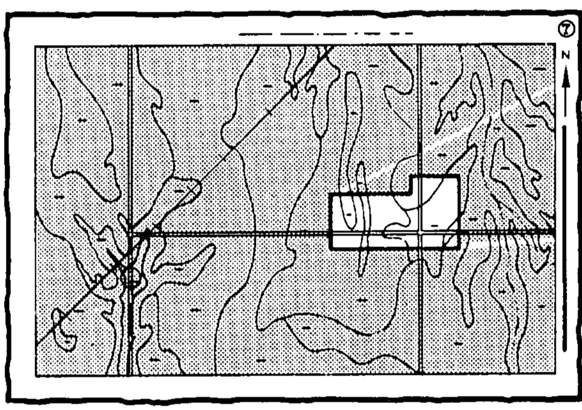
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

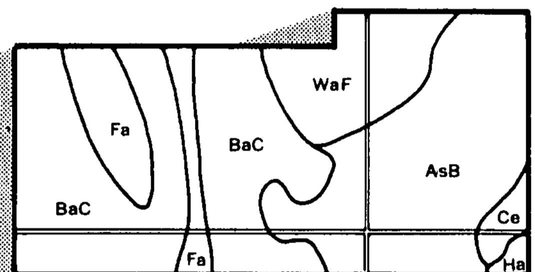




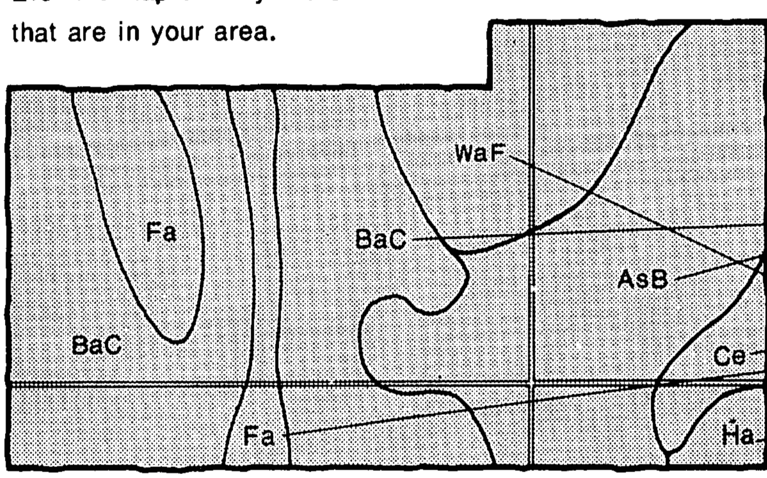
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area.



Symbols

AsB
BaC
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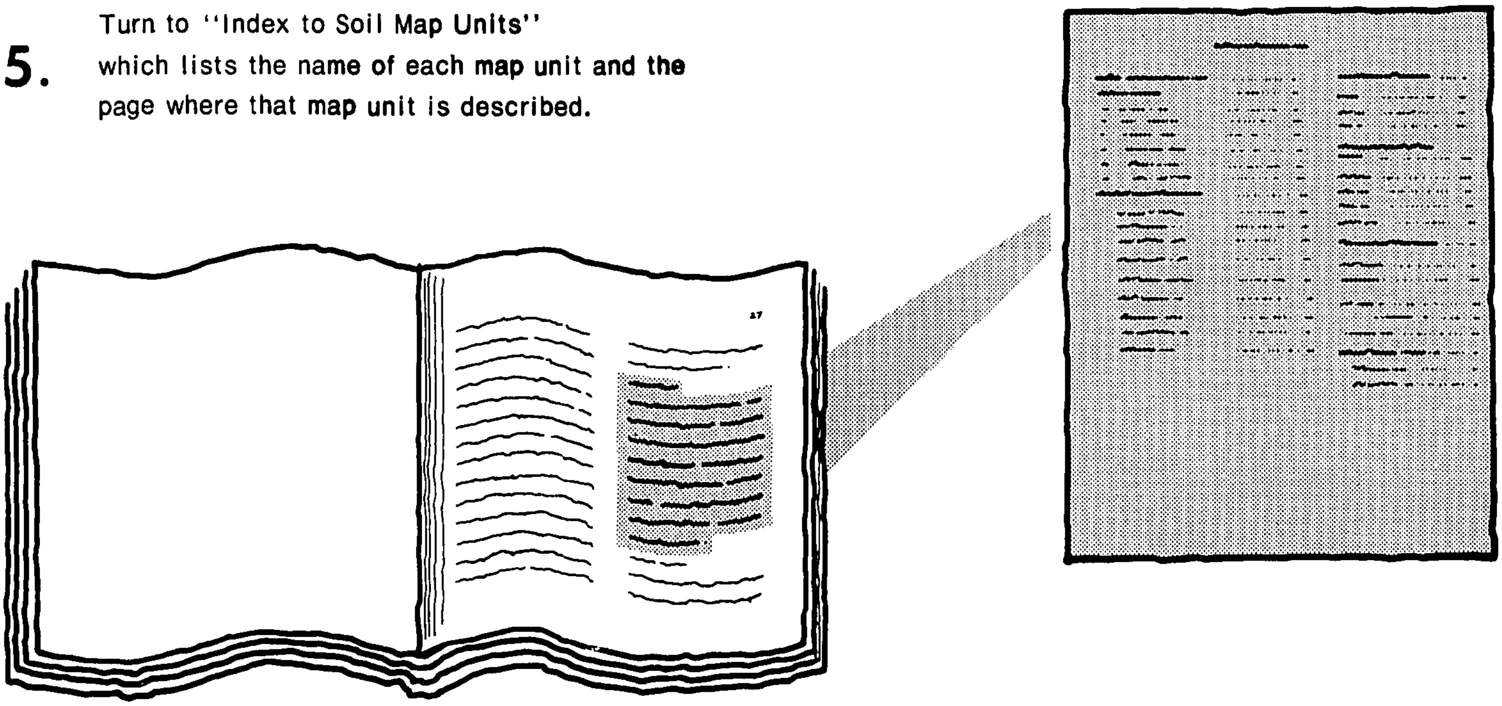
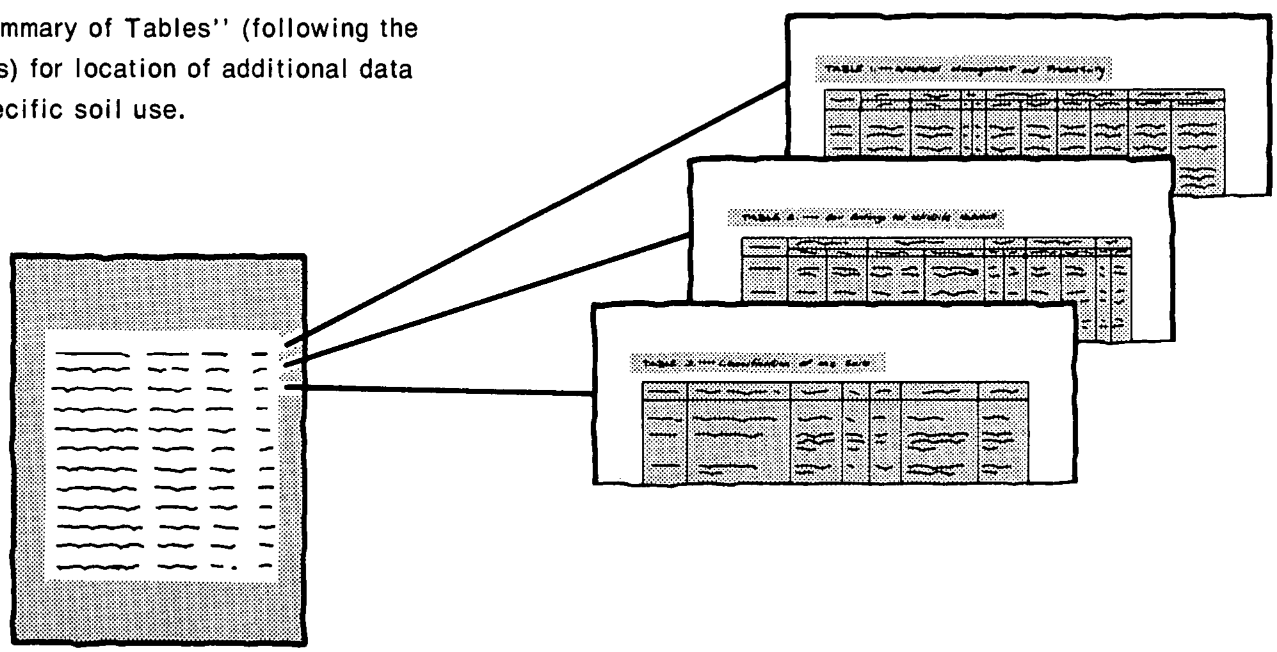
THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1977-79. Soil names and descriptions were approved in 1980. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979. This survey was made cooperatively by the Soil Conservation Service, the Purdue University Agricultural Experiment Station, and the Indiana Department of Natural Resources, Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Huntington County Soil and Water Conservation District. Financial assistance was made available by the Soil and Water Conservation Committee, Indiana Department of Natural Resources, and by the Huntington County Commissioners.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: A grassed waterway helps to slow runoff from an area of Morley clay loam, 6 to 12 percent slopes, severely eroded.

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soil series

Issued December 1982

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foreword

This soil survey contains information that can be used in land-planning programs in Huntington County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

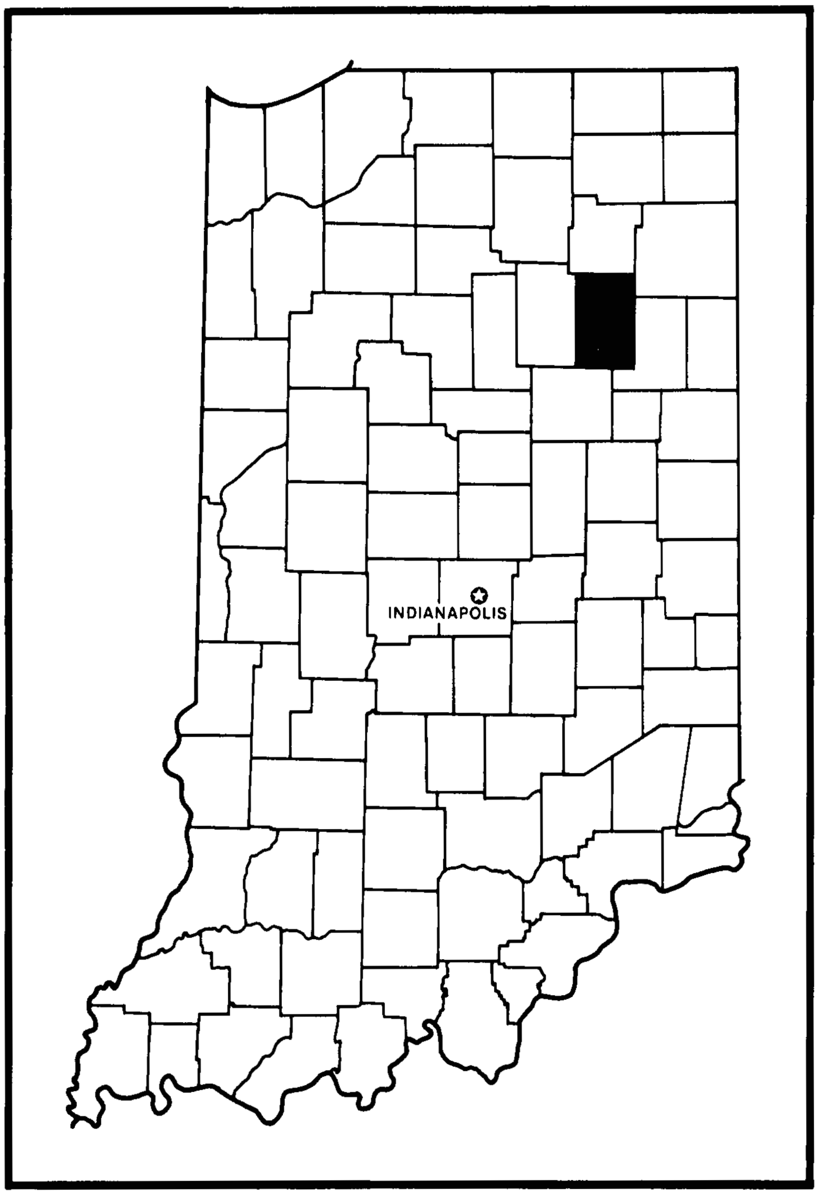
This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Robert L. Eddleman

Robert L. Eddleman
State Conservationist
Soil Conservation Service



Location of Huntington County in Indiana.

soil survey of
Huntington County, Indiana

By Earl D. Lockridge and Earnest L. Jensen, Soil Conservation Service

Fieldwork by Earl D. Lockridge, Soil Conservation Service, and
Stephen W. Tardy and Carl F. Walker, Indiana Department of
Natural Resources

United States Department of Agriculture, Soil Conservation Service
in cooperation with
Purdue University Agricultural Experiment Station
and the Indiana Department of Natural Resources
Soil and Water Conservation Committee

HUNTINGTON COUNTY is in the northeastern part of Indiana. It has an area of 390 square miles, or 249,600 acres. The county is about 24 miles from north to south and 16 miles from east to west.

The county was organized in 1834. The city of Huntington is the county seat. Population of the county is about 34,970 (*6*). Local businesses and industries employ a large segment of the county work force. Farming and the businesses related to agriculture are the main enterprises.

Generally, the county is nearly level to moderately sloping in the southern part and nearly level to strongly sloping in the northern part. It is strongly sloping to very steep in areas dissected by the major streams and their tributaries. Elevation ranges from 660 feet to about 912 feet.

About 159,059 acres of the county is in cropland. The acreage in farms decreased about 6.3 percent in the period 1969-74 (*5*).

general nature of the county

This section gives general information concerning Huntington County. It discusses general features, such as relief, water resources, transportation, trends in land use, and climate, that have an effect on soil use in the county.

relief

The southern two-thirds of Huntington County is generally nearly level to moderately sloping. The northern one-third is mainly nearly level to strongly sloping. Areas that are dissected by the Wabash, Salamonie, and Little Rivers and their tributaries in Dallas, Huntington, Jackson, and Polk Townships are strongly sloping to very steep.

The highest point in Huntington County is in the northwest corner. Elevation there is about 912 feet. The lowest point is on the west edge near where the Wabash River flows out of the county. Elevation at the lowest point is about 660 feet.

water resources

Subsurface water is the main source of potable water in Huntington County. Water for the city of Huntington is mainly supplied by eight deep wells. This is supplemented by water from the Wabash River. The Huntington and Salamonie reservoirs are the main recreational sites in the county. The Huntington reservoir draws its water from the Wabash River, and the Salamonie reservoir draws its water from the Salamonie River.

transportation

About 21 miles of Interstate 69 is along the east-central and southeastern parts of Huntington County. U.S. Highway 24 extends northeast to Fort Wayne and west to Wabash from the city of Huntington, and U.S. Highway 224 extends southeast from the city of Huntington to Wells County. State highways include Indiana 3, 5, 9, and 105 in a north-south direction and Indiana 16, 114, 124, and 218 in an east-west direction. In addition, Huntington County has an extensive network of county roads.

Railroads provide freight service from the city of Huntington to Fort Wayne and Chicago and to Wabash and Wells Counties and connecting points beyond. The nearest rail passenger service is in Fort Wayne in Allen County.

The Huntington County municipal airport serves the area for limited commuter and private flights.

trends in land use

In 1974 about 77 percent of Huntington County was in farmland (*5*). The acreage in farmland decreased about 12,000 acres between 1969 and 1974. This represents a 6.3 percent drop in land farmed. Woodland makes up approximately 7 percent of the land in Huntington County. The acreage in urban land is expected to increase, especially in the northeastern part of the county. Urban land is being developed at the expense of farmland.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Huntington County is cold in winter but quite hot in summer. Winter precipitation, frequently snow, results in sufficient accumulation of soil moisture by spring to minimize drought during summer on most soils. Generally, annual precipitation is adequate for all crops that are adapted to the temperature and length of the growing season in the county.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Huntington in the period 1951 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 28 degrees F, and the average daily minimum temperature is 20 degrees. The lowest temperature on record, which occurred at Huntington on January 16, 1972, is -19 degrees. In summer the average temperature is 72 degrees, and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on September 2, 1953, is 103 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 22 inches. Of this, 60 percent usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 5.07 inches at Huntington on June 26, 1959. Thunderstorms occur on about 41 days each year, and most occur in summer.

Average seasonal snowfall is 32 inches. The greatest snow depth at any one time during the period of record was 15 inches. On an average of 17 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in winter.

Tornadoes and severe thunderstorms occur occasionally. These storms are generally local and of short duration. They cause damage in a variable pattern.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their suitability for major land uses. Table 4 shows the extent of the map units shown on the general soil map. It lists the suitabilities of each, in relation to that of the other map units, for major land uses and shows soil properties that limit use. Soil suitability ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

Each map unit is rated for *cultivated crops, pasture, woodland, urban uses,* and *recreation areas.* Cultivated crops are those grown extensively in the survey area. Grasses and legumes are grown for hay and pasture. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas are campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic. Extensive recreation areas are those used for nature study and as wilderness.

The names, descriptions, and delineations of soils on the general soil map of this county do not always agree or join fully with those of adjoining counties published at an earlier date. These differences generally result from changes in concepts of soil series in the application of the soil classification system. Some differences are brought about by a different predominance of soils in map units made up of two or three series. Still other differences may be caused by the range in slope allowed within the map unit of adjoining surveys. In this county or in adjacent counties a map unit is sometimes too small to be delineated.

1. Blount-Pewamo

Deep, nearly level and gently sloping, somewhat poorly drained and very poorly drained, medium textured and moderately fine textured soils formed in calcareous glacial till

Areas of this map unit consist of broad flats, low knolls, and slight depressions or shallow drainageways on till plains and moraines. Slope ranges from 0 to 4 percent.

This map unit makes up about 62 percent of the county. About 47 percent of the unit is Blount soils, and 42 percent is Pewamo soils. The remaining 11 percent is minor soils (fig. 1).

The somewhat poorly drained, nearly level and gently sloping Blount soils are on convex rises and low knolls. They have a surface layer of dark grayish brown silt loam. The subsoil is brown and yellowish brown, mottled silty clay loam.

The very poorly drained, nearly level Pewamo soils are in depressions. They have a surface layer of very dark gray silty clay loam. The subsoil is dark gray and gray, mottled silty clay loam.

Of minor extent are the moderately well drained Glynwood soils, the moderately well drained and well drained Rawson Variant soils on low knolls and side slopes of the minor drainageways, and the somewhat poorly drained Haskins Variant soils on low sandier rises. The poorly drained Patton soils and Patton, sandy substratum, soils are in old shallow lakebeds that are slightly lower than the surrounding landscape.

The soils in this map unit are well suited to cultivated crops if adequately drained. Most areas are used for growing corn, soybeans, and small grains. Wetness and erosion are the main management concerns.

These soils are well suited to grasses and legumes for hay or pasture if adequately drained. A few areas are used for this purpose. The main management concerns are wetness and erosion.

Trees are well suited to these soils. A few areas remain in woodland. Wetness, ponding, and plant competition are the main management concerns.

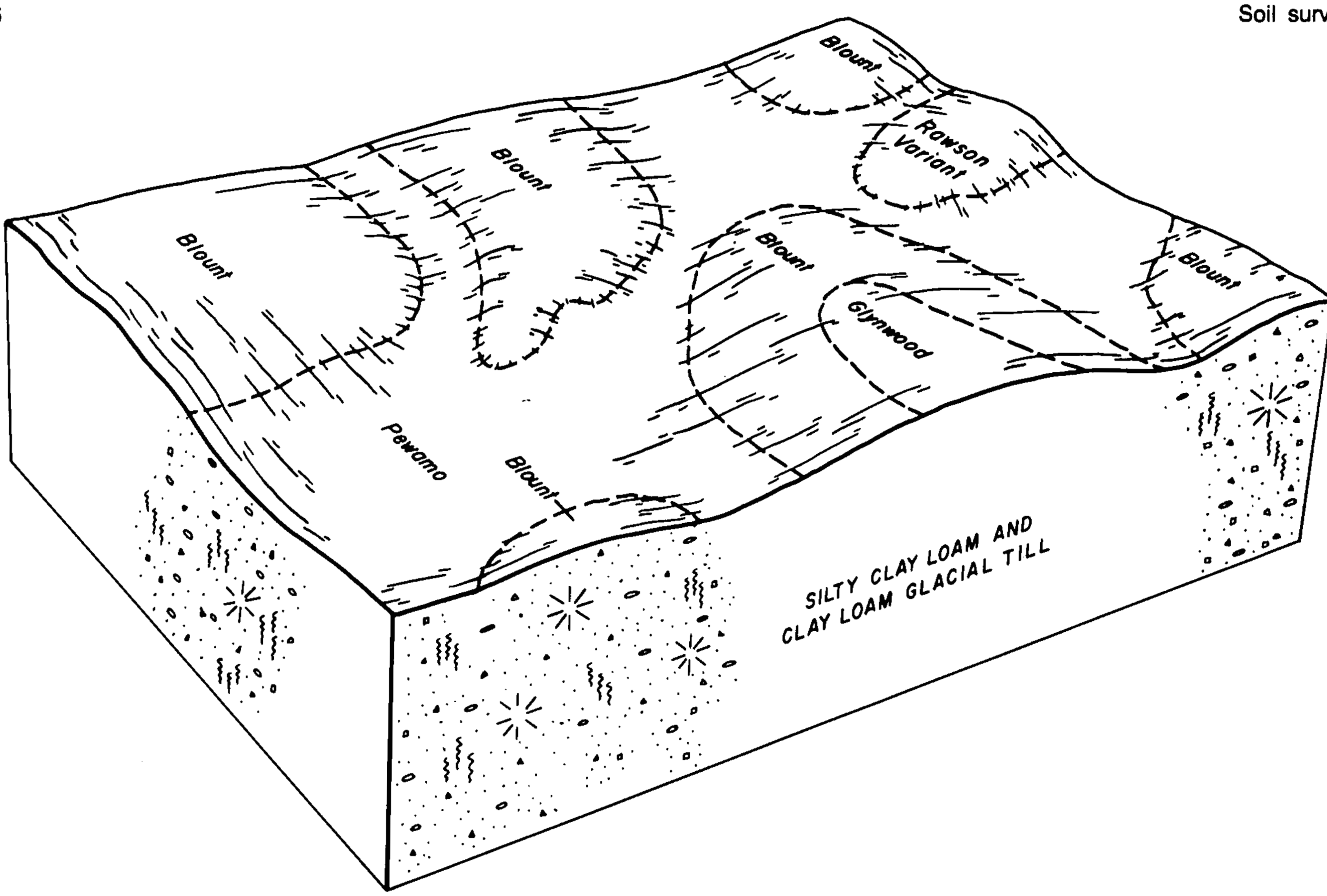


Figure 1.—Relationship of soils to topography and underlying material in the Blount-Pewamo map unit.

The soils in this map unit are poorly suited to building sites and septic tank absorption fields. Ponding, wetness, and moderately slow and slow permeability are the main management concerns.

2. Morley-Blount-Pewamo

Deep, steep to nearly level, well drained, somewhat poorly drained, and very poorly drained, medium textured and moderately fine textured soils formed in calcareous glacial till

Areas of this map unit consist of knolls, ridges, side slopes, deep depressions, and drainageways on till plains and moraines. Slope ranges from 0 to 30 percent.

This map unit makes up about 27 percent of the county. About 34 percent of the unit is Morley soils, 32 percent is Blount soils, and 16 percent is Pewamo soils. The remaining 18 percent is minor soils.

The well drained, moderately sloping to steep Morley soils are on knolls, ridges, and side slopes. They have a surface layer of brown silt loam. The subsoil is yellowish brown silt loam in the upper part and brown clay loam, silty clay loam, and clay in the lower part.

The somewhat poorly drained, nearly level and gently sloping Blount soils are on low lying knolls. They have a surface layer of dark grayish brown silt loam. The subsoil is brown and yellowish brown, mottled silty clay loam.

The very poorly drained Pewamo soils are in deep depressions and drainageways. They have a surface layer of very dark gray silty clay loam. The subsoil is dark gray and gray, mottled silty clay loam.

Of minor extent are the moderately well drained Glynwood soils on knolls and side slopes and the somewhat poorly drained Whitaker soils on narrow outwash terraces. The moderately well drained Eel soils and the somewhat poorly drained Shoals soils are on narrow flood plains, and the Hennepin soils are on steep to very steep, narrow side slopes along drainageways.

The soils in this map unit are suited to cultivated crops if adequately drained. Most areas are used for growing corn, soybeans, and small grains. Slope, wetness, and erosion are the main management concerns.

These soils are well suited to grasses and legumes for hay or pasture if adequately drained. A few areas are used for this purpose. Wetness, slope, and erosion are the main management concerns.

Trees are well suited to these soils. Some areas remain in woodland. Slope, wetness, ponding, and plant competition are the main management concerns.

The soils in this map unit are poorly suited to building sites and septic tank absorption fields. The main management concerns are slope, ponding, wetness, and moderately slow and slow permeability.

3. Genesee-Ockley-Fox

Deep or moderately deep over sand and gravel, nearly level to moderately sloping, well drained, medium textured soils formed in stratified alluvial and glacial outwash sediments

Areas of this map unit consist of terraces, outwash plains, and flood plains. Slope ranges from 0 to 12 percent.

This map unit makes up about 4 percent of the county. About 23 percent of the unit is Genesee soils, 13 percent is Ockley soils, and 12 percent is Fox soils. The remaining 52 percent is minor soils (fig. 2).

The well drained, nearly level Genesee soils are on broad flood plains. They have a surface layer of dark brown and brown silt loam. The underlying material is brown and dark yellowish brown silt loam and thin strata of sandy loam.

The well drained, nearly level and gently sloping Ockley soils are on terraces and outwash plains. They have a surface layer of brown loam. The subsoil is dark yellowish brown and brown fine sandy loam and sandy loam over dark brown gravelly sandy clay loam. Gravelly coarse sand is at a depth of 55 inches.

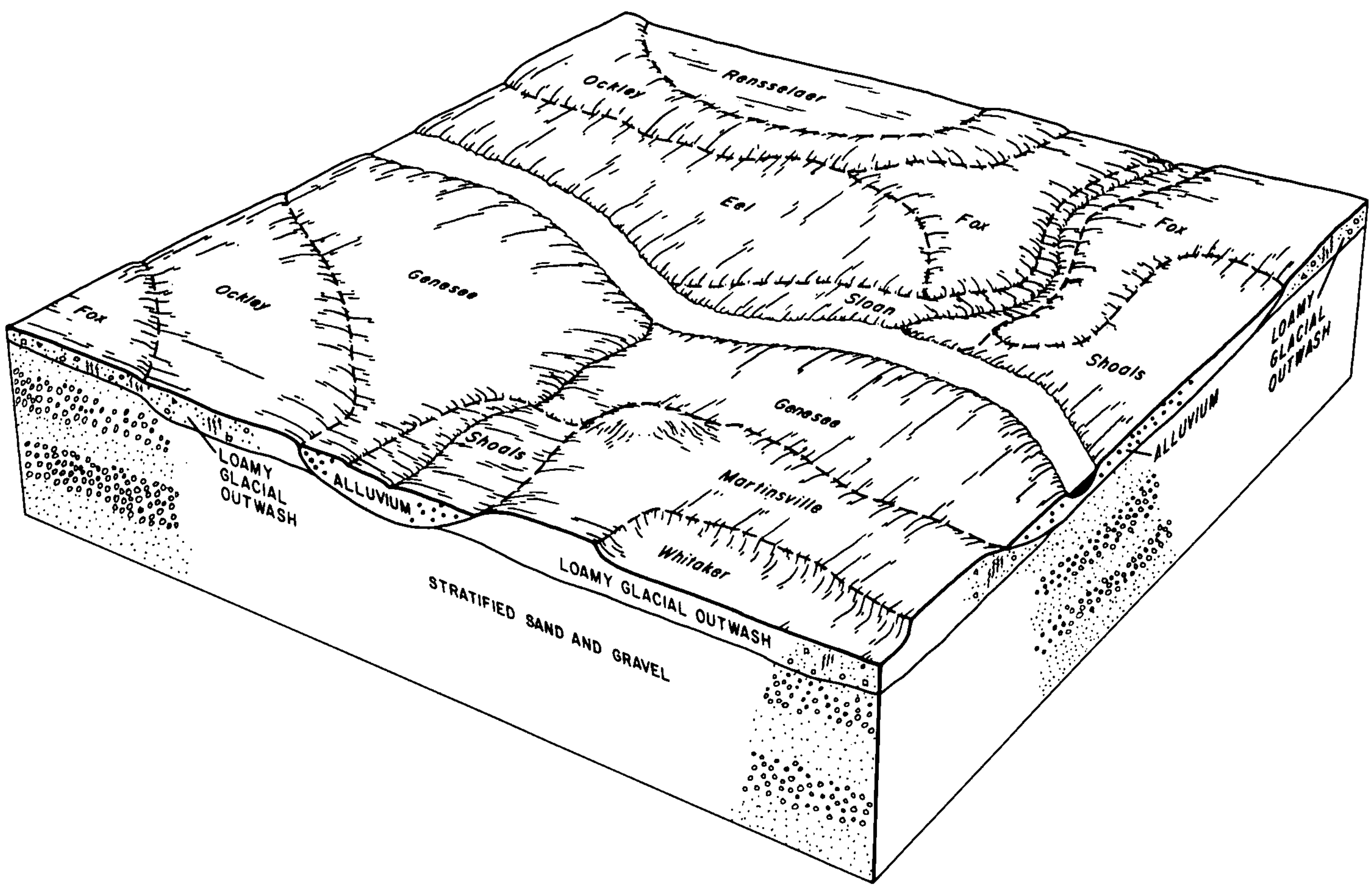


Figure 2.—Relationship of soils to topography and underlying material in the Genesee-Ockley-Fox map unit.

The well drained, nearly level to moderately sloping Fox soils are on terraces and outwash plains. They have a surface layer of brown loam. The subsoil is brown and dark yellowish brown gravelly clay loam over dark yellowish brown gravelly sandy clay loam. Gravelly coarse sand is at a depth of about 30 inches.

Of minor extent are the moderately well drained Eel soils and the somewhat poorly drained Shoals soils in low lying positions on flood plains. The very poorly drained Sloan soils are in depressions on flood plains, the well drained Martinsville soils and somewhat poorly drained Whitaker soils are on terraces and outwash plains, and the very poorly drained Rensselaer soils are in narrow depressions and swales next to the uplands.

The soils in this map unit are well suited to cultivated crops. Most areas are used for growing corn, soybeans, and small grains. The main management concerns are droughtiness, flooding, and erosion.

These soils are well suited to grasses and legumes for hay or pasture. Some areas are used for this purpose. The main management concerns are droughtiness, flooding, and erosion.

Trees are well suited to these soils. Some areas remain in woodland. Plant competition is the main management concern.

The soils of this map unit are suited to building sites and septic tank absorption fields. Flooding, slope, and poor filtering qualities are the main management concerns.

4. Randolph-Millsdale-Milton

Moderately deep, nearly level to strongly sloping, somewhat poorly drained, very poorly drained, and well drained, medium textured and moderately fine textured soils formed in glacial material and in residuum from dolomite and limestone bedrock

Areas of this map unit consist of upland depressions, knolls, ridges, and side slopes that are underlain by dolomite and limestone bedrock. Some areas occur as shelves along the major streams. Slope ranges from 0 to 15 percent.

This map unit makes up about 4 percent of the county. About 34 percent of the unit is Randolph soils, 20 percent is Millsdale soils, and 18 percent is Milton soils. The remaining 28 percent is minor soils.

The somewhat poorly drained, nearly level Randolph soils are on slight rises. They have a surface layer of brown loam. The subsoil is grayish brown, mottled clay loam.

The very poorly drained, nearly level Millsdale soils are in slight depressions. They have a surface layer of very dark grayish brown silty clay loam. The subsoil is dark gray, mottled silty clay over gray, mottled channery silty clay loam.

The well drained, nearly level to strongly sloping Milton soils are on knolls, ridges, and side slopes. They have a surface layer of brown silt loam. The subsoil is dark yellowish brown clay loam over channery clay loam.

Of minor extent are the somewhat poorly drained Shoals soils and the moderately well drained Eel soils on flood plains. The well drained Martinsville soils, the somewhat poorly drained Whitaker soils, and the very poorly drained Rensselaer soils are on terraces and outwash plains.

The soils in this map unit are well suited to cultivated crops if adequately drained. Most areas are used for growing corn, soybeans, and small grains. The main management concerns are wetness, ponding, and erosion.

These soils are well suited to grasses and legumes for hay or pasture if adequately drained. Some areas are used for this purpose. The main management concerns are wetness, ponding, and erosion.

Trees are well suited to this soil. Some areas remain in woodland. The main management concerns are wetness, ponding, and plant competition.

This map unit is generally not suitable for building sites and septic tank absorption fields. The main management concerns are ponding, wetness, depth to rock, slope, and moderately slow permeability.

5. Patton-Shoals-Rensselaer

Deep, nearly level, poorly drained, somewhat poorly drained, and very poorly drained, moderately fine textured and medium textured soils formed in stratified lacustrine, alluvial, and glacial outwash sediments

Areas of this map unit consist of broad lake plains, flood plains, low lying terraces, and outwash plains. Slope ranges from 0 to 2 percent.

This map unit makes up about 2 percent of the county. About 37 percent of the unit is Patton, sandy substratum soils, 22 percent is Shoals soils, and 17 percent is Rensselaer soils. The remaining 24 percent is minor soils.

The poorly drained, nearly level Patton, sandy substratum, soils are in slight depressions on low, broad lake plains. They have a surface layer of black and very dark gray silty clay loam. The subsoil is gray, mottled silty clay loam. The underlying material is multicolored fine sandy loam, fine sand, and clay loam.

The somewhat poorly drained, nearly level Shoals soils are on flood plains along major streams. They have a surface layer of dark grayish brown silt loam. The underlying material dominantly is dark grayish brown, mottled loam and sandy loam.

The very poorly drained, nearly level Rensselaer soils are on low lying terraces and outwash plains. They have a surface layer of very dark grayish brown loam and silt loam. The subsoil is dark gray and grayish brown, mottled silt loam and clay loam over gray, mottled loam.

Of minor extent are the somewhat poorly drained Whitaker soils on slight rises on terraces and outwash plains. The somewhat poorly drained Aptakisic soils are on slight rises and low ridges on outwash plains. The well drained Martinsville soils are on low ridges on terraces and outwash plains. The poorly drained Patton soils are in swales and depressions.

The soils in this map unit are well suited to cultivated crops if adequately drained. Most areas are used for growing corn, soybeans, and small grains. Wetness, flooding, and ponding are the main management concerns.

These soils are well suited to grasses and legumes for hay or pasture if adequately drained. Some areas are being used for this purpose. The main management concerns are wetness, flooding, and ponding.

Trees are suited to these soils. Some areas remain in woodland. The main management concerns are wetness, ponding, and plant competition.

The soils in this map unit are generally not suitable for building sites and septic tank absorption fields because of wetness, ponding, moderately slow permeability, and flooding.

6. Martinsville-Eel-Genesee

Deep, nearly level to moderately sloping, well drained and moderately well drained, medium textured soils formed in stratified alluvial and glacial outwash sediments

Areas of this map unit consist of terraces, outwash plains, and flood plains that are adjacent to uplands. Slope ranges from 0 to 8 percent.

This map unit makes up about 1 percent of the county. About 47 percent of the unit is Martinsville soils, 16 percent is Eel soils, and 12 percent is Genesee soils. The remaining 25 percent is minor soils.

The well drained, nearly level to moderately sloping Martinsville soils are on terraces and outwash plains. They have a surface layer of dark grayish brown silt loam. The subsoil is dark yellowish brown and brown silt loam, loam, and sandy clay loam over brown sandy loam.

The moderately well drained, nearly level Eel soils are on flood plains. They have a surface layer of dark brown silt loam. The underlying material is brown silt loam over brown and dark grayish brown, mottled loam, silty clay loam, and clay loam that have thin strata of sandy loam.

The well drained, nearly level Genesee soils are on broad flood plains. They have a surface layer of dark brown and brown silt loam. The underlying material is brown and dark yellowish brown silt loam and has thin strata of sandy loam.

Of minor extent are the somewhat poorly drained Whitaker soils and the very poorly drained Rensselaer soils in narrow depressions adjacent to uplands. The somewhat poorly drained Shoals soils are in depressions and swales on flood plains.

The soils in this map unit are well suited to cultivated crops. Most areas are used for growing corn, soybeans, and small grains. The main management concerns are erosion and flooding.

These soils are well suited to grasses and legumes for hay or pasture. Some areas are used for this purpose. The main management concerns are erosion and flooding.

Trees are well suited to these soils. Some areas remain in woodland. Plant competition is the main management concern.

The soils in this map unit are poorly suited to building sites and septic tank absorption fields. Flooding and wetness are the main management concerns.

broad land use considerations

Deciding which land should be used for urban development is an important issue in the survey area. Each year land is being developed for urban uses in Jackson, Clear Creek, Huntington, and Salamonie Townships. An estimated 27,000 acres, or nearly 11 percent of the survey area, is urban, built-up, or recreation land. The general soil map is most helpful for planning the general outline of urban areas; it cannot be used for the selection of sites for specific urban structures. In table 4, the suitability and limitation of map units on the general soil map for specified uses are given. The data about specific soils in the survey area can be helpful in planning future land use patterns.

Areas in which the soils are so unfavorable that urban development is not desirable or nearly prohibitive are extensive in the survey area. The Genesee, Eel, and Shoals soils in the Genesee-Ockley-Fox and the Martinsville-Eel-Genesee map units have a severe hazard of flooding and ponding. Extensive drainage is required on the wet soils in the Blount-Pewamo map unit. The Morley-Blount-Pewamo map unit is poorly suited to urban development because of slow permeability and steepness of slope. The Patton-Shoals-Rensselaer and the Randolph-Millsdale-Milton map units are generally not suitable for urban development because of ponding and flooding. Also, dolomite and limestone bedrock are at a moderate depth in soils of these map units.

The soils in several areas of the county can be developed for urban uses at a lower cost than the soils that have various limitations. Examples are the Martinsville, Ockley, and Fox soils in the Genesee-Ockley-Fox and the Martinsville-Eel-Genesee map units.

The Blount-Pewamo map unit is well suited to farming but poorly suited to nonfarm uses because of wetness, ponding, and slow or moderately slow permeability. With proper subsurface and surface drainage, these limitations can be overcome. It is important to understand that the soils are well suited to farming because sufficient drainage has been provided.

Most soils in the county are well suited to woodland. Commercially valuable trees are less common and generally do not grow as rapidly on the wetter soils in the Blount-Pewamo and Patton-Shoals-Rensselaer map units as they do on soils in other units. Most woodland areas have been harvested several times. The acreage of woodland is decreasing in the county, especially on the nearly level to moderately sloping soils that can be used for cultivated crops (fig. 3). The remaining continuous tracts of woodland are on steeper areas in the Morley-Blount-Pewamo map unit. Small tracts of woodland are common in the other units but generally are confined to soils that are very poorly drained or too steep to farm.

The steeper areas of the Morley-Blount-Pewamo map unit are suited to parks, campgrounds, picnic areas, and other intensive recreation uses. Hardwood forests enhance the beauty of part of this unit. The terrace, outwash plain, and flood plain positions in areas of the Genesee-Ockley-Fox and the Martinsville-Eel-Genesee map units are well suited to intensive recreation uses. Other map units on the general soil map are suited to intensive recreation or poorly suited because of wetness. Undrained areas of the Blount-Pewamo, the Morley-Blount-Pewamo, the Randolph-Millsdale-Milton, and the Patton-Shoals-Rensselaer map units are good for nature studies. All of the units on the general soil map provide habitat for many important species of wildlife.

All parts of the county are well suited to extensive recreation uses; however, each general soil map unit provides its own uniquely different environment for nature study. Because of the variety of land conditions and farming operations, the Blount-Pewamo, the Morley-Blount-Pewamo, and the Martinsville-Eel-Genesee map units have a higher quantity and more species of wildlife than the other map units.

Figure 3.—Clearing a woodlot in an area of Blount silt loam, 1 to 4 percent slopes, eroded, increases tillable acreage.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Morley silt loam, 6 to 12 percent slopes, eroded, is one of several phases in the Morley series.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. These dissimilar soils are described in each map unit. Also, some of the more unusual or strongly contasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, gravel, is an example. Some miscellaneous areas are large enough to be delineated on the soil maps. Some that are too small to be delineated are identified by a special symbol on the soil maps.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

ApA—Aptakisic silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on outwash plains. Areas are irregular in shape and range from 5 to 40 acres.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 25 inches thick. The upper part is brown, mottled, firm silty clay loam, and the lower part is yellowish brown, mottled, firm silty clay loam. The underlying material to a depth of 60 inches is brown, mottled silt loam and has thin strata of loam. In places the subsoil and underlying material have more sand and less silt. More clay is in the subsoil in places, and bedrock is within a depth of 60 inches in some areas.

Included with this soil in mapping are small areas of well drained Martinsville soils on slight rises. Small areas of poorly drained Patton soils and very poorly drained Rensselaer soils are in depressions. The included soils make up 5 to 7 percent of the mapped areas.

This Aptakisic soil has high available water capacity and is moderately permeable. The organic matter content in the surface layer is moderate. Surface runoff is slow. The seasonal high water table is at a depth of 1 foot to 3 feet.

Most areas of this soil are drained and used for cultivated crops. A few areas are used for hay or pasture. A few areas that are not drained are in woodland.

This soil is well suited to corn, soybeans, and small grains if adequately drained. Wetness is the main limitation in use and management. Subsurface drains and shallow surface drains with adequate outlets can be used to remove excess water. Conservation tillage that leaves protective amounts of crop residue on the surface and winter cover crops help to maintain and improve structure, tilth, and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture if adequately drained. Deep-rooted legumes, such as alfalfa, grow poorly in undrained areas of this soil because they cannot tolerate the high water table. Grazing or overgrazing when the soil is too wet causes surface compaction and poor tilth. Pasture rotation, proper stocking rates, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

This soil has severe limitations for building sites because of wetness. The installation of subsurface drains helps to lower the water table.

This soil has severe limitations for roads and streets because of low strength and frost action. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic. Providing adequate drainage along roads and streets helps to reduce the possibility of frost action.

This soil has severe limitations for septic tank absorption fields because of wetness. The installation of subsurface drains around the outer edge of the absorption field helps to remove excess water.

This soil is in capability subclass IIw and woodland suitability subclass 2o.

BcB2—Blount silt loam, 1 to 4 percent slopes, eroded. This nearly level and gently sloping, deep, somewhat poorly drained soil is on convex rises and low knolls of broad till plains. Areas are irregular in shape and range from 2 to 100 acres.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is brown and yellowish brown, mottled, firm silty clay loam about 16 inches thick. The underlying material to a depth of 60 inches is brown, mottled silty clay loam and clay loam. Some areas have a silt mantle as much as 24 inches thick. In places the upper part of the subsoil has more sand and less clay. Some areas have a loamy sand or clay loam surface layer. Slope is more than 4 percent in places.

Included with this soil in mapping are small areas of moderately well drained Glynwood soils on higher lying positions. Small areas of well drained Morley soils are on narrow steeper slopes along drainageways. Small areas of very poorly drained Pewamo soils are in depressions, and moderately well drained or well drained Rawson Variant soils are on slight rises. The included soils make up 7 to 12 percent of the mapped areas.

This Blount soil has moderate available water capacity and is slowly permeable. The organic matter content in the surface layer is moderate. Surface runoff is medium. The seasonal high water table is at a depth of 1 foot to 3 feet.

Most areas of this soil are drained and used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains if adequately drained. Erosion is the main hazard in use and management. Crop rotation, grassed waterways, and grade stabilization structures help to prevent erosion. Conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to control erosion and maintain or improve organic matter content, structure, and tilth. Wetness is a limitation. Subsurface drains with adequate outlets can be used to remove excess water.

This soil is well suited to grasses and legumes for hay or pasture if adequately drained. Using this soil for hay or pasture helps to control water erosion. Deep-rooted legumes, such as alfalfa, do poorly in undrained areas of this soil because they cannot tolerate the high water table. Grazing or overgrazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil has severe limitations for building sites because of wetness. The installation of subsurface drains helps to lower the water table. Existing vegetation should be disturbed as little as possible during construction, and those areas that are disturbed should be revegetated as soon after construction as possible to reduce erosion.

This soil has severe limitations for roads and streets because of low strength and frost action. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic. Providing adequate drainage along roads and streets helps to reduce the possibility of frost action.

This soil has severe limitations for septic tank absorption fields because of wetness and slow permeability. Filling or mounding the absorption field with a more suitable fill material and elevating the field help to overcome the slow permeability. The installation of subsurface drains around the outer edge of the absorption field helps to remove excess water.

This soil is in capability subclass IIe and woodland suitability subclass 3o.

ChB—Chelsea loamy sand, 3 to 12 percent slopes. This gently sloping and moderately sloping, deep, excessively drained soil is on ridges and side slopes near stream valleys. Areas are long and narrow and dominantly about 8 acres.

Typically, the surface layer is dark brown loamy sand about 7 inches thick. The subsurface layer is dark yellowish brown loamy sand about 47 inches thick. In the lower part, it contains thin bands of dark brown sandy loam. The underlying material to a depth of 60 inches is brown sand. In places, slope is less than 3 percent or more than 12 percent.

Included with this soil in mapping are small areas of well drained Martinsville soils on slight rises, well drained Morley soils on narrow, steeper slopes along drainageways, and poorly drained Patton soils and very poorly drained Rensselaer soils in depressions. The included soils make up 10 to 15 percent of the mapped areas.

This Chelsea soil has low available water capacity and is rapidly permeable. The organic matter content in the surface layer is low. Surface runoff is medium. The surface layer is very friable and can be tilled through a wide range of moisture conditions.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is poorly suited to corn, soybeans, and small grains. Droughtiness is the main hazard in use and management. Conservation tillage that leaves protective amounts of crop residue on the surface and green manure crops help to reduce wind and water erosion and maintain moisture and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. Using this soil for hay or pasture helps to control wind and water erosion. Proper stocking rates, pasture renovation, and timely deferment of grazing help to keep the pasture in good condition.

Trees are suited to this soil. Seedling mortality during drought periods is the main management concern. Some replanting of seedlings may be necessary. Planting special stock and overstocking help to overcome seedling mortality. The control or removal of unwanted trees and shrubs that compete for moisture can be accomplished by spraying, cutting, or girdling.

This soil is suitable for building sites and local roads and streets; however, slope of more than 8 percent is a moderate limitation. Where slope is more than 8 percent, buildings need to be designed to complement the slope, cutting and filling is needed, and roads and streets should be built on the contour where possible. Existing vegetation should be disturbed as little as possible during construction, and those areas that are disturbed should be revegetated as soon after construction as possible to reduce erosion. This soil has severe limitations for septic tank absorption fields because of poor filtering qualities. Although sewage effluent is readily absorbed into this soil, it does not adequately filter the effluent. This may result in the pollution of ground water supplies.

This soil is in capability subclass IVs and woodland suitability subclass 3s.

Ee—Eel silt loam, occasionally flooded. This nearly level, deep, moderately well drained soil is on flood plains. It is subject to occasional flooding of brief duration from October to June. Areas are long and narrow and range from 10 to 200 acres or more.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The underlying material to a depth of 60 inches is brown silt loam in the upper part; brown and dark grayish brown, mottled loam with thin strata of sandy loam in the next part; dark grayish brown, mottled silty clay loam and loam with thin strata of sandy loam in the next part; and brown, mottled clay loam with thin strata of sandy loam in the lower part. In places sand and gravel are below a depth of 50 inches. The surface layer and the upper part of the underlying material have more sand or silt in places. Bedrock is within a depth of 60 inches in some areas.

Included with this soil in mapping are small areas of well drained Genesee soils on slightly higher lying positions, somewhat poorly drained Shoals soils on slightly lower lying positions, and very poorly drained Sloan soils in depressions. The included soils make up 7 to 10 percent of the mapped areas.

This Eel soil has high available water capacity and is moderately permeable. The surface layer has moderate organic matter content. Surface runoff is slow. The seasonal high water table is at a depth of 3 to 6 feet.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains. Flooding is the main hazard in use and management. Late planting or replanting is sometimes necessary because of occasional flooding. Conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to maintain and improve organic matter content and maintain good structure and tilth.

This soil is well suited to grasses and legumes for hay or pasture. Grazing or overgrazing when this soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil is generally not suitable for building sites and septic tank absorption fields because of flooding and wetness. It has severe limitations for local roads because of flooding and frost action. Constructing roads on raised, well compacted fill material and providing side ditches and culverts for adequate drainage help to protect the roads from flood and frost damage.

This soil is in capability subclass IIw and woodland suitability subclass 1o.

FoA—Fox loam, 0 to 2 percent slopes. This nearly level, well drained soil is moderately deep over sand and gravel. It is on broad terraces and outwash plains along the valleys of major streams. Areas are elongated and range from 5 to 100 acres or more.

Typically, the surface layer is brown loam about 11 inches thick. The subsoil is about 25 inches thick. It is brown, firm clay loam in the upper part and brown, firm gravelly clay loam in the lower part. The underlying material to a depth of 60 inches is yellowish brown very gravelly coarse sand. In places this soil is shallower or deeper to sand and gravel. In places the underlying material has more clay and less sand. Slope is more than 2 percent in places. Bedrock is within a depth of 60 inches in some areas.

Included with this soil in mapping are small areas of very poorly drained Rensselaer soils in depressions and somewat poorly drained Whitaker soils on lower lying positions. Also included are small areas of well drained soils that have a stony or gravelly surface layer. The included soils make up 5 to 13 percent of the mapped areas.

This Fox soil has moderate available water capacity. The permeability is moderate in the surface layer and subsoil and rapid in the underlying material. The organic matter content of the surface layer is moderate. Surface runoff is slow.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains. Droughtiness is the main hazard in use and management. Conservation tillage that leaves protective amounts of crop residue on the surface and green manure crops help to improve tilth and maintain moisture and organic matter content. Irrigation helps to increase soil moisture.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when this soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. The main management concern is plant competition. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil is suitable for dwellings with basements. It has moderate limitations for dwellings without basements because of shrink-swell. Foundations, footings, and basement walls should be strengthened. Backfilling with coarse material helps to prevent structural damage caused by shrinking and swelling.

This soil has moderate limitations for local roads and streets because of frost action and shrink-swell. Frost action and shrinking and swelling on roads and streets can be controlled by replacing or covering the upper soil layers with a suitable base material.

This soil has severe limitations for septic tank absorption fields because of poor filtering qualities. Although sewage effluent is readily absorbed into this soil, it does not adequately filter the effluent. This may result in the pollution of ground water supplies.

This soil is in capability subclass IIs and woodland suitability subclass 2o.

FoB—Fox loam, 2 to 6 percent slopes. This gently sloping, well drained soil is moderately deep over sand and gravel. It is on terraces and outwash plains along the valleys of major streams. Areas are elongated and range from 5 to 75 acres.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil is about 22 inches thick. The upper part is brown, firm gravelly clay loam; the next part is dark yellowish brown, firm gravelly clay loam; and the lower part is dark yellowish brown, friable gravelly sandy clay loam. The underlying material to a depth of 60 inches is yellowish brown, loose very gravelly coarse sand. In places this soil is shallower or deeper to sand and gravel. In places the underlying material has more clay and less sand. Slope is less than 2 percent or more than 6 percent in some areas. Bedrock is within a depth of 60 inches in areas.

Included with this soil in mapping are small areas of very poorly drained Rensselaer soils in depressions and somewhat poorly drained Whitaker soils on lower lying positions. Also included are small areas of well drained soils that have a stony or gravelly surface layer and small areas in which the surface layer is mainly material from the subsoil. The included soils make up 5 to 13 percent of the mapped areas.

This Fox soil has moderate available water capacity. The permeability is moderate in the surface layer and subsoil and rapid in the underlying material. The organic matter content in the surface layer is moderate. Surface runoff is medium.

Most areas of this soil are used for cutivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains. Erosion is the main hazard in use and management; droughtiness is also a hazard. Crop rotation, cover crops, grassed waterways, grade stabilization structures, and conservation tillage that leaves protective amounts of crop residue on the surface help to prevent excessive soil loss. Cover crops and conservation tillage help to reduce crusting and compaction and preserve moisture. They also improve infiltration, aeration, organic matter content, structure, and tilth. Irrigation and green manure crops help to increase soil moisture.

This soil is well suited to grasses and legumes for hay or pasture. Using this soil for hay or pasture helps to control water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. The main management concern is plant competition. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil is suitable for dwellings with basements. It has moderate limitations for dwellings without basements because of shrink-swell. Foundations, footings, and basement walls should be strengthened. Backfilling with coarse material helps to prevent structural damage caused by shrinking and swelling. Existing vegetation should be disturbed as little as possible during construction, and those areas that are disturbed should be revegetated as soon after construction as possible to reduce erosion.

This soil has moderate limitations for local roads and streets because of frost action and shrink-swell. Frost action and shrinking and swelling on roads and streets can be controlled by replacing or covering the upper soil layers with a suitable base material.

This soil has severe limitations for septic tank absorption fields because of poor filtering qualities. Although sewage effluent is readily absorbed into this soil, it does not adequately filter the effluent. This can result in the pollution of ground water supplies.

This soil is in capability subclass IIe and woodland suitability subclass 2o.

FoC2—Fox loam, 6 to 12 percent slopes, eroded. This moderately sloping, well drained soil is moderately deep over sand and gravel. It is on terraces and outwash plains along the valleys of major streams. Areas are elongated and dominantly about 10 acres.

Typically, the surface layer is brown loam about 7 inches thick. The subsoil is brown, firm gravelly clay loam about 20 inches thick. The underlying material to a depth of 60 inches is brown, loose gravelly coarse sand. In places this soil is shallower or deeper to sand and gravel. In places the underlying material has more clay and less sand. Slope is less than 6 percent or more than 12 percent in places. In areas the surface layer consists mainly of material from the subsoil. Bedrock is within a depth of 60 inches in some areas.

Included with this soil in mapping are small areas of very poorly drained Rensselaer soils in depressions and somewhat poorly drained Whitaker soils on lower lying positions. Also included are small areas of well drained soils that have a stony or gravelly surface layer. The included soils make up 5 to 13 percent of the mapped areas.

This Fox soil has moderate available water capacity. Permeability is moderate in the surface layer and upper part of the subsoil and rapid in the underlying material. The organic matter content in the surface layer is moderate. Surface runoff is medium.

Most areas of this soil are used for hay or pasture. Some areas are used for cultivated crops or woodland.

This soil is suited to corn, soybeans, and small grains. Erosion is the main hazard. Droughtiness is also a hazard if these soils are cultivated. Conservation practices help to control erosion and surface runoff in cultivated cropland. Conservation tillage that leaves protective amounts of crop residue on the surface, crop rotation, contour farming, diversions, terraces, and grade stabilization structures help to reduce runoff and excessive soil loss. Conservation tillage and cover crops help to maintain or improve the tilth, moisture, and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Using this soil for hay or pasture helps to control water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. The main management concern is plant competition. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil has moderate limitations for dwellings without basements because of shrink-swell and slope and for dwellings with basements because of slope. Foundations, footings, and basement walls should be strengthened. Backfilling with coarse material helps to prevent structural damage caused by the shrinking and swelling. Buildings need to be designed to complement the slope. Existing vegetation should be disturbed as little as possible during construction, and those areas that are disturbed should be revegetated as soon after construction as possible to reduce erosion.

This soil has moderate limitations for local roads and streets because of frost action, shrink-swell, and slope. Frost action and shrinking and swelling on roads and streets can be controlled by replacing or covering the upper soil layers with a suitable base material. Cutting and filling is needed, and roads and streets should be built on the contour where possible.

This soil has severe limitations for septic tank absorption fields because of poor filtering qualities. Although sewage effluent is readily absorbed into this soil, it does not adequately filter the effluent. This may result in the pollution of ground water supplies.

This soil is in capability subclass IIIe and woodland suitability subclass 2o.

Ge—Genesee silt loam, occasionally flooded. This nearly level, deep, well drained soil is on flood plains. It is subject to occasional flooding of brief duration from October to June. Areas are elongated and range from 10 to 100 acres.

Typically, the surface soil is dark brown and brown silt loam about 18 inches thick. The underlying material to a depth of 60 inches is brown and dark yellowish brown silt loam that has thin strata of sandy loam. In places the surface soil and the upper part of the underlying material has more sand or silt. In some areas bedrock is within a depth of 60 inches.

Included with this soil in mapping are small areas of moderately well drained Eel soils on slightly lower lying positions, somewhat poorly drained Shoals soils on lower lying positions, and very poorly drained Sloan soils in depressions. The included soils make up 6 to 8 percent of the mapped areas.

This Genesee soil has high available water capacity and is moderately permeable. The surface soil has moderate organic matter content. Surface runoff is slow.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains. Flooding is the main hazard in use and management. Late planting or replanting is sometimes necessary because of occasional flooding. Conservation tillage that leaves protective amounts of crop residue on the surface and winter cover crops help to maintain or improve organic matter content and maintain good structure and tilth.

This soil is well suited to grasses and legumes for hay or pasture. Grazing or overgrazing when this soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil is generally not suitable for building sites and septic tank absorption fields because of flooding. It has severe limitations for local roads because of flooding. Constructing roads on raised, well compacted fill material and providing side ditches and culverts for adequate drainage help to protect the roads from flood damage.

This soil is in capability subclass IIw and woodland suitability subclass 1o.

GlB2—Glynwood silt loam, 3 to 7 percent slopes, eroded. This gently sloping and moderately sloping, deep, moderately well drained soil is on convex rises on till plains and moraines. Areas are irregular in shape and range from 3 to 40 acres.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil is dark yellowish brown and brown, mottled, firm clay loam about 23 inches thick. The underlying material to a depth of 60 inches is yellowish brown, mottled clay loam. In places the silt mantle is as much as 24 inches thick. Some areas have a loamy sand or clay loam surface layer. In places slope is more than 7 percent.

Included with this soil in mapping are small areas of somewhat poorly drained Blount soils on slightly lower lying positions. Also included are small areas of well drained Hennepin and Morley soils on narrow, steeper side slopes along drainageways, very poorly drained Pewamo soils in depressions, and moderately well drained or well drained Rawson Variant soils on slight rises. The included soils make up 10 to 12 percent of the mapped areas.

This Glynwood soil has moderate available water capacity and is slowly permeable. The organic matter content in the surface layer is moderate. Surface runoff is medium, and the seasonal high water table is at a depth of 2 to 3.5 feet.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains. Erosion is the main hazard in use and management. Crop rotation, cover crops, grassed waterways, grade stabilization structures, and conservation tillage that leaves protective amounts of crop residue on the surface help to prevent excessive soil loss. Cover crops and conservation tillage help to reduce crusting and compaction, preserve moisture, and improve infiltration, aeration, organic matter content, structure, and tilth.

This soil is well suited to grasses and legumes for hay or pasture. Using this soil for hay or pasture helps to control water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. The main management concern is plant competition. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil has moderate limitations for dwellings without basements because of wetness and shrink-swell and has severe limitations for dwellings with basements because of wetness. The installation of subsurface drains helps to lower the water table. Foundations, footings, and basement walls should be strengthened. Backfilling with coarse material helps to prevent structural damage caused by shrinking and swelling. Existing vegetation should be disturbed as little as possible during construction, and those areas that are disturbed should be revegetated as soon after construction as possible to reduce erosion.

This soil has severe limitations for local roads and streets because of low strength and frost action. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic. Providing adequate drainage along roads helps to reduce the possibility of frost action.

This soil has severe limitations for septic tank absorption fields because of wetness and slow permeability. The installation of subsurface drains around the outer edge of the absorption field helps to remove excess water. Filling or mounding the absorption field with a more suitable fill material and elevating the field help to overcome the slow permeability.

This soil is in capability subclass IIIe and woodland suitability subclass 2o.

HcA—Haskins Variant fine sandy loam, 1 to 4 percent slopes. This nearly level and gently sloping, deep, somewhat poorly drained soil is on till plains. Areas are irregular in shape and are dominantly about 6 acres.

Typically, the surface layer is dark grayish brown fine sandy loam about 10 inches thick. The subsoil is about 27 inches thick. The upper part is brown, mottled, friable sandy loam; the next part is yellowish brown, mottled, friable loam; and the lower part is brown, mottled, friable loam and firm silty clay loam. The underlying material to a depth of 60 inches is yellowish brown, mottled clay loam. In places the depth to firm till is more than 40 inches. In places the subsoil has more sand and less clay, or the upper part of the subsoil has more clay and less sand. In some areas, the surface layer is dark colored, and in places slope is more than 4 percent.

Included with this soil in mapping are small areas of very poorly drained Pewamo soils in depressions. Also included are small areas of moderately well drained or well drained Rawson Variant soils on slight rises. The included soils make up 8 to 12 percent of the mapped areas.

This Haskins Variant soil has moderate available water capacity. It is moderately permeable in the surface layer and upper part of the subsoil and slowly permeable in the lower part of the subsoil and underlying material. The organic matter content in the surface layer is moderate. Surface runoff is slow. The seasonal high water table is at a depth of 1 foot to 2.5 feet.

Most areas of this soil are drained and used for cultivated crops. Some areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains if adequately drained. Wetness is the main limitation in use and management. If adequately drained and properly managed, this soil can be intensively cropped. Subsurface drains with adequate outlets can be installed to remove the excess water. Conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to maintain structure, tilth, and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture if adequately drained. Deep-rooted legumes, such as alfalfa, grow poorly in undrained areas of this soil because they cannot tolerate the high water table. Overgrazing or grazing when the soil is too wet can cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. The main management concern is plant competition. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

This soil has severe limitations for building sites because of wetness. The installation of subsurface drains helps to lower the water table.

This soil has severe limitations for local roads and streets because of frost action. Constructing roads and streets on well compacted fill material and providing side ditches and culverts for adequate drainage help to protect the roads and streets from frost damage.

This soil has severe limitations for septic tank absorption fields because of wetness and slow permeability. The installation of subsurface drains around the outer edge of the absorption field helps to remove the excess water. Filling or mounding the absorption field with a more suitable fill material and elevating the field help to overcome the slow permeability.

This soil is in capability subclass IIw and in woodland suitability subclass 2o.

HeG—Hennepin loam, 30 to 70 percent slopes. This steep and very steep, deep, well drained soil is on long narrow side slopes along drainageways. Areas are elongated and narrow and range from 5 to 100 acres.

Typically, the surface layer is very dark grayish brown loam about 5 inches thick. The subsoil is yellowish brown, friable loam about 9 inches thick. The underlying material to a depth of 60 inches is brown loam. In places slope is less than 30 percent or more than 70 percent.

Included with this soil in mapping are small areas of moderately well drained Glynwood soils on higher lying positions and well drained Morley soils on narrow slopes along drainageways. The included soils make up 4 to 8 percent of the mapped areas.

This Hennepin soil has moderate available water capacity. Permeability is moderately slow. The organic matter content in the surface layer is moderate. Surface runoff is very rapid.

Most areas of this soil are in woodland. A few areas are used for pasture.

This soil is generally not suited to cultivated crops. Erosion is the main hazard in use and management of this soil, and slope is a limitation. Most types of farm machinery are difficult to use because of the steepness of slope.

This soil is poorly suited to grasses and legumes for hay or pasture because of water erosion and steep slopes. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to reduce surface compaction and maintain good tilth.

Trees are suited to this soil. The main management concerns are erosion hazard, equipment limitation, and plant competition. Because of the erosion hazard and equipment limitation, roads, skid trails, and landings need to be located on gentle grades, and water bars, outsloping road surfaces, culverts, and drop structures are needed to help remove the water. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil is generally not suitable for building sites because of slope, for local roads and streets because of slope and low strength, and for septic tank absorption fields because of slope and moderately slow permeability.

This soil is in capability subclass VIIe and woodland suitability subclass 1r.

Ho—Houghton muck, drained. This nearly level, deep, very poorly drained soil is in deep depressions on moraines, till plains, or outwash plains that were formerly shallow lakes or marshes. It is ponded by surface runoff from adjacent higher lying soils. Areas are irregular or circular in shape and are dominantly about 5 acres.

Typically, the surface layer is black muck about 10 inches thick. The underlying material to a depth of 60 inches is friable muck. The upper part is black, and the lower part is dark reddish brown and has many partially decomposed fibers. In places the organic material is less than 51 inches deep. The degree of decomposition and type of organic material are variable in places. Some areas do not have adequate drainage and remain wet most of the year. Also, in places 15 to 20 inches of silt loam is on the surface.

Included with this soil in mapping are small areas of poorly drained Patton soils on slightly higher lying positions and very poorly drained Pewamo soils on slightly higher lying positions. Sedimentary peat or marl is at a depth of 20 to 50 inches in some areas. The included soils make up 8 to 10 percent of the mapped areas.

This Houghton soil has very high available water capacity. Permeability is moderately slow to moderately rapid. Organic matter content in the surface layer is very high, and surface runoff is very slow or ponded. The seasonal high water table is at or above the surface. The surface layer is friable and easily tilled.

Most areas of this soil are drained and used for cultivated crops. Some areas are used for hay, pasture, or woodland. Undrained areas have wetland vegetation and wetland wildlife habitat.

This soil is suited to corn and soybeans. Wetness is the main limitation, and ponding and wind erosion are hazards in use and management. Subsurface drains, ditches, and pump drainage can be used to remove excess water. Conservation tillage that leaves protective amounts of crop residue on the surface and windbreaks help to reduce wind erosion. Overdrainage of this soil can result in accelerated subsidence. Raising the water table during fallow periods slows the rate of subsidence. Fire is a hazard when the organic material is dry, because the muck will burn.

This soil is well suited to grasses for pasture or hay. Using this soil for hay or pasture helps to contol wind erosion. Deep-rooted legumes, such as alfalfa, grow poorly in undrained areas of this soil because they cannot tolerate the high water table. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are suited to this soil. The main management concerns are equipment limitation, seedling mortality, windthrow hazard, and plant competition. Woodland operations should be timed to dry periods or to seasons of the year when the ground is frozen. This soil generally is not suited to crawler or rubber-tired tractors. Special equipment is needed to harvest wood products. Some replanting of seedlings is generally necessary. Species that tolerate wetness should be favored in stands. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

This soil is generally not suitable for building sites because of ponding and low strength and for septic tank absorption fields because of ponding and moderately slow permeability. It has severe limitations for local roads because of ponding, low strength, and frost action. Replacing the organic layers with suitable material to overcome the low strength is necessary. Constructing side ditches and culverts to provide adequate drainage helps to protect roads from ponding and frost damage.

This soil is in capability subclass IIIw and woodland suitability subclass 4w.

McA—Martinsville silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on terraces and outwash plains. Areas are irregular in shape and range from 3 to 100 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 38 inches thick. The upper part is dark yellowish brown and yellowish brown, firm clay loam; the next part is yellowish brown, friable loam; and the lower part is yellowish brown, friable sandy clay loam. The underlying material to a depth of 60 inches is dark yellowish brown sandy loam. In places slope is more than 2 percent. The underlying material is sand and gravel in places. Some areas have a loamy sand surface layer. Also, in places bedrock is within a depth of 60 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Aptakisic soils on lower lying positions, excessively drained Chelsea soils on the crests of hills and ridges, very poorly drained Rensselaer soils in depressions, and somewhat poorly drained Whitaker soils on lower lying positions. Also included are small areas of well drained soils that have a stony to gravelly surface layer. The included soils make up 5 to 10 percent of the mapped areas.

This Martinsville soil has high available water capacity and is moderately permeable. The organic matter content in the surface layer is moderate. Surface runoff is slow.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains. Conservation tillage that leaves protective amounts of crop residue on the surface and winter cover crops help to maintain and improve organic matter content and tilth.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

This soil has moderate limitations for building sites because of shrink-swell. Foundations, footings, and basement walls should be strengthened. Backfilling with a coarse material helps prevent structural damage caused by the shrinking and swelling.

This soil has moderate limitations for local roads and streets because of low strength and frost action. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic. Providing adequate drainage along roads and streets helps to reduce the possibility of frost action. This soil is suitable for septic tank absorption fields.

This soil is in capability class I and woodland suitability subclass 1o.

McB—Martinsville silt loam, 2 to 8 percent slopes. This gently sloping and moderately sloping, deep, well drained soil is on terraces and outwash plains. Areas are irregular in shape and range from 3 to 50 acres.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 39 inches thick. The upper part is dark yellowish brown, friable silt loam, and the lower part is brown, friable loam, sandy clay loam, and sandy loam. The underlying material to a depth of 60 inches is dark yellowish brown sandy loam and has thin strata of loamy sand. In places slope is less than 2 percent or more than 8 percent. The underlying material is sand and gravel in places. Some areas have a loamy sand surface layer. In places bedrock is within a depth of 60 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Aptakisic soils on lower lying positions, excessively drained Chelsea soils on crests of hills and ridges, very poorly drained Rensselaer soils in depressions, and somewhat poorly drained Whitaker soils on lower lying positions. Also included are small areas in which the surface layer is mostly material from the subsoil and well drained soils that have a stony to gravelly surface layer. The included soils make up 5 to 10 percent of the mapped areas.

This Martinsville soil has high available water capacity and is moderately permeable. The organic matter content in the surface layer is moderate. Surface runoff is medium.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains. Erosion is the main hazard in use and management. Crop rotation, cover crops, grassed waterways, grade stabilization structures, and conservation tillage that leaves protective amounts of crop residue on the surface help to prevent excessive soil loss. Cover crops and conservation tillage help to reduce crusting and compaction, preserve moisture, and improve infiltration, aeration, organic matter content, structure, and tilth.

This soil is well suited to grasses and legumes for hay or pasture. Hay and pasture are effective in helping to control water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

This soil has moderate limitations for building sites because of shrink-swell. Foundations, footings, and basement walls should be strengthened. Backfilling with a coarse material helps to prevent structural damage caused by the shrinking and swelling. Existing vegetation should be disturbed as little as possible during construction, and those areas that are disturbed should be revegetated as soon after construction as possible to reduce erosion.

This soil has moderate limitations for local roads and streets because of low strength and frost action. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic. Providing adequate drainage along roads and streets helps to reduce the possibility of frost action. This soil is suitable for septic tank absorption fields.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

Ms—Millsdale silty clay loam. This nearly level, moderately deep, very poorly drained soil is in upland drainageways and depressions. It is underlain by dolomite and limestone bedrock. This soil is ponded by surface runoff from adjacent higher lying soils. Areas are irregular in shape and range from 5 to 80 acres.

Typically, the surface soil is very dark grayish brown silty clay loam about 14 inches thick. The subsoil is dark gray, mottled, firm silty clay about 7 inches thick. The underlying material is gray, mottled channery silty clay loam. Very pale brown, hard dolomite bedrock is at a depth of about 25 inches. Some areas are not drained and stay wet most of the year. Some areas are underlain with soft siltstone. In places the depth to bedrock is more than 40 inches.

Included with this soil in mapping are small areas of well drained Milton soils on higher lying positions and somewhat poorly drained Randolph soils on slightly higher lying positions. The included soils make up 4 to 10 percent of the mapped areas.

This Millsdale soil has low available water capacity. Permeability is moderately slow. The organic matter content in the surface layer is high. Surface runoff is very slow or ponded. The seasonal high water table is at or above the surface. Root development is restricted below a depth of about 25 inches.

Most areas of this soil are drained and used for cultivated crops. Some areas are used for hay or pasture. The undrained areas are left in woodland.

This soil is well suited to corn, soybeans, and small grains if adequately drained. Wetness is the main limitation in the use and management of this soil, and ponding is a hazard. Shallow surface drains and subsurface drains with adequate outlets can be used to remove excess water. In some areas, the depth to bedrock interferes with the installation of subsurface drains. Conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to improve and maintain structure, tilth, and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture if adequately drained. Deep-rooted legumes, such as alfalfa, grow poorly in undrained areas of this soil because they cannot tolerate the high water table. Grazing or overgrazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are suited to this soil. The main management concerns are equipment limitation, seedling mortality, windthrow hazard, and plant competition. Harvesting of trees is generally timed to dry periods or to seasons of the year in which the ground is frozen. Some replanting of seedlings is generally necessary. Species that tolerate wetness should be favored in stands. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

This soil is generally not suitable for building sites and septic tank absorption fields because of ponding, depth to rock, and the moderately slow permeability. It has severe limitations for local roads because of low strength, ponding, and frost action. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic. Constructing roads on raised, well compacted fill material and providing side ditches and culverts to insure adequate drainage help to protect the roads from ponding and frost damage.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

MtA—Milton silt loam, 0 to 2 percent slopes. This nearly level, moderately deep, well drained soil is on uplands that are underlain by dolomite and limestone bedrock. Areas are irregular in shape and range from 3 to 50 acres.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil is about 22 inches thick. The upper part is yellowish brown and brown, firm clay loam, and the lower part is yellowish brown, friable silt loam. Light yellowish brown, hard dolomite bedrock is at a depth of about 31 inches. Some areas are underlain by soft siltstone. In places slope is more than 2 percent, and in places the depth to bedrock is more than 40 inches.

Included with this soil in mapping are small areas of very poorly drained Millsdale soils in depressions and somewhat poorly drained Randolph soils on slightly lower lying positions. Also included are small areas in which bedrock is exposed at the surface and small areas that have a stony to channery surface layer. The included soils make up 5 to 10 percent of the mapped areas.

This Milton soil has low available water capacity, and permeability is moderately slow. The organic matter content in the surface layer is moderate. Surface runoff is slow. Root development is restricted below a depth of about 31 inches.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains. Droughtiness is the main hazard in use and management. Conservation tillage that leaves protective amounts of crop residue on the surface and green manure crops help to maintain moisture, organic matter content, and tilth.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

This soil is generally not suitable for building sites because of the depth to rock and is not suitable for septic tank absorption fields because of depth to rock and moderately slow permeability. It has severe limitations for local roads because of low strength. The base material for roads needs to be strengthened or replaced with a more suitable material to support vehicular traffic.

This soil is in capability subclass IIs and woodland suitability subclass 2o.

MtB—Milton silt loam, 2 to 6 percent slopes. This gently sloping, moderately deep, well drained soil is on uplands. It is underlain by dolomite and limestone bedrock. Areas are irregular in shape and range from 3 to 40 acres.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil is dark yellowish brown, firm clay loam and channery clay loam about 17 inches thick. Very pale brown, hard dolomite bedrock is at a depth of about 24 inches. Some areas are underlain by soft siltstone. In places slope is less than 2 percent or more than 6 percent. In places the depth to bedrock is more than 40 inches.

Included with this soil in mapping are small areas of very poorly drained Millsdale soils in depressions and somewhat poorly drained Randolph soils on slightly lower lying positions. Also included are small areas that have bedrock exposed at the surface and small areas in which the surface layer is mostly material from the subsoil or the surface layer is stony to channery. The included soils make up about 5 to 10 percent of the mapped areas.

This Milton soil has low available water capacity. Permeability is moderately slow. The organic matter content in the surface layer is moderate. Surface runoff is medium. Root development is restricted below a depth of about 24 inches.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains. Erosion is the main hazard in use and management; droughtiness is also a hazard. Crop rotation, cover crops, grassed waterways, grade stabilization structures, and conservation tillage that leaves protective amounts of crop residue on the surface help to prevent excessive soil loss. Cover crops and conservation tillage help to reduce crusting and compaction, preserve moisture, and improve infiltration, aeration, organic matter content, structure, and tilth.

This soil is well suited to grasses and legumes for hay or pasture. Using this soil for hay or pasture helps to control water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

This soil is generally not suitable for building sites because of depth to rock. It is not suitable for septic tank absorption fields because of depth to rock and moderately slow permeability. This soil has severe limitations for local roads because of low strength. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic.

This soil is in capability subclass IIe and woodland suitability subclass 2o.

MtC—Milton silt loam, 6 to 15 percent slopes. This moderately sloping and strongly sloping, moderately deep, well drained soil is on uplands. It is underlain by dolomite and limestone bedrock. Areas are irregular in shape and range from 3 to 25 acres.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsoil is about 18 inches thick. The upper part is dark yellowish brown and brown, firm clay loam, and the lower part is light olive brown, firm silty clay loam. Light gray, hard dolomite bedrock is at a depth of about 23 inches. In places this soil is underlain by soft siltstone. Slope is less than 6 percent or more than 15 percent in places. In places the depth to bedrock is more than 40 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Randolph soils on slightly lower lying positions and very poorly drained Millsdale soils in depressions. Also included are small areas in which bedrock is exposed at the surface, or the surface layer is mainly material from the subsoil, or the surface layer is stony to channery. The included soils make up 5 to 10 percent of the mapped areas.

This Milton soil has low available water capacity. Permeability is moderately slow. The organic matter content in the surface layer is moderate. Surface runoff is medium. Root development is restricted below a depth of about 23 inches.

Most areas of this soil are used for hay, pasture, or woodland. Some areas are used for cultivated crops.

This soil is suited to corn, soybeans, and small grains. Erosion is the main hazard; droughtiness is a hazard if this soil is cultivated. Conservation practices help to control erosion and surface runoff in cultivated cropland. Crop rotations, conservation tillage that leaves protective amounts of crop residue on the surface, diversions, contour farming, terraces, and grade stabilization structures help to reduce runoff and excessive soil loss. Cover crops and conservation tillage help to improve and maintain tilth, moisture, and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. The use of this soil for hay or pasture helps to control water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

This soil is generally not suitable for building sites because of depth to rock. It is not suitable for septic tank absorption fields because of depth to rock and the moderately slow permeability. This soil has severe limitations for local roads because of low strength. The base material for roads needs to be strengthened or replaced with a more suitable material to support vehicular traffic.

This soil is in capability subclass IIIe and woodland suitability subclass 2o.

MxC2—Morley silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on till plains and moraines. Areas are irregular in shape and range from 3 to 25 acres.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 21 inches thick. The upper part is yellowish brown, friable silt loam, and the lower part is brown, firm silty clay loam, clay, and clay loam. The underlying material to a depth of 60 inches is brown clay loam. In places the subsoil is thinner, and calcareous clay loam or silty clay loam is at a shallower depth. Slope is less than 6 percent or more than 12 percent in places. In some areas the surface layer is mainly material from the subsoil. In places the surface layer is loamy sand.

Included with this soil in mapping are small areas of somewhat poorly drained Blount soils and moderately well drained Glynwood soils on lower lying positions and excessively drained Chelsea soils on crests of hills and ridges. Also included are small areas of well drained Hennepin soils on steep side slopes and moderately well drained or well drained Rawson Variant soils on slight rises. The included soils make up 5 to 10 percent of the mapped areas.

This Morley soil has moderate available water capacity and is slowly permeable. The organic matter content in the surface layer is moderate. Surface runoff is medium.

Most areas of this soil are used for cultivated crops. Some areas are used for hay, pasture, or woodland.

This soil is suited to corn, soybeans, and small grains. Erosion is the main hazard in use and management. Conservation practices help to control erosion and surface runoff in cultivated cropland. Crop rotation, conservation tillage that leaves protective amounts of crop residue on the surface, diversions, contour farming, terraces, grassed waterways, and grade stabilization structures help to reduce runoff and excessive soil loss (fig. 4). Conservation tillage and cover crops help to improve and maintain tilth, moisture, and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Hay and pasture are effective in helping to control water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. The main management concern is plant competition. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil has moderate limitations for building sites because of shrink-swell and slope. Foundations, footings, and basement walls should be strengthened. Backfilling with a coarse material helps to prevent structural damage caused by the shrinking and swelling. Buildings need to be designed to complement the slope. Existing vegetation should be disturbed as little as possible during construction, and those areas that are disturbed should be revegetated as soon after construction as possible to reduce erosion.

This soil has severe limitations for local roads and streets because of low strength. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic.

This soil has severe limitations for septic tank absorption fields because of slow permeability. Landshaping and installing the distribution lines across the slope generally are necessary for proper functioning of the absorption field. Filling or mounding the absorption field with a more suitable fill material and elevating the field help to overcome the slow permeability.

This soil is in capability subclass IIIe and woodland suitability subclass 2o.

MxD2—Morley silt loam, 12 to 18 percent slopes, eroded. This strongly sloping, deep, well drained soil is on ridges and side slopes that border deeply dissected drainageways on till plains and moraines (fig. 5). Areas are irregular in shape and range from 3 to 25 acres.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil is yellowish brown, firm clay loam about 23 inches thick. The underlying material is yellowish brown clay loam to a depth of 60 inches. In places the subsoil is thinner, and calcareous clay loam or silty clay loam is at a shallower depth. In places the slope is less than 12 percent or more than 18 percent,

Figure 4.—An area of unprotected Morley silt loam, 6 to 12 percent slopes, eroded. Conservation tillage or terraces help to reduce erosion in areas of this soil.

and in some areas the surface layer is mainly material from the subsoil.

Included with this soil in mapping are small areas of somewhat poorly drained Blount soils on lower lying positions and excessively drained Chelsea soils on the crests of hills and ridges. Also included are small areas of moderately well drained Glynwood soils on lower lying positions, well drained Hennepin soils on steep side slopes, and moderately well drained or well drained Rawson Variant soils on slight rises. The included soils make up 5 to 10 percent of the mapped areas.

This Morley soil has moderate available water capacity and is slowly permeable. The organic matter content in the surface layer is moderate. Surface runoff is rapid.

Most areas of this soil are used for hay or pasture. Some areas remain in woodland, and a few areas are used for cultivated crops.

This soil is poorly suited to corn, soybeans, and small grains. Erosion is the main hazard in use and management. Conservation practices are needed to control erosion and surface runoff in cultivated cropland. Conservation tillage that leaves protective amounts of

Figure 5.—Morley silt loam, 12 to 18 percent slopes, eroded, in the background forms the breaks along the Wabash River. Randolph loam and Millsdale silty clay loam are in the foreground.

crop residue on the surface, diversions, contour farming, and terraces or grade stabilization structures help to reduce runoff and excessive soil loss. Conservation tillage and cover crops help to improve or maintain tilth, available moisture capacity, and organic matter content of this soil. Crop rotations that include grasses and legumes for hay and pasture most of the time are effective in reducing runoff and controlling erosion. The use of most types of farm machinery is difficult because of the steepness of slope.

This soil is well suited to grasses and legumes for hay or pasture. The use of this soil as hayland and pasture helps to control water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. The main management concern is plant competition. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil has moderate limitations for building sites because of shrink-swell and slope. Foundations, footings, and basement walls should be strengthened. Backfilling with coarse textured material helps to prevent structural damage caused by shrinking and swelling of this soil. Buildings need to be designed to complement the slope. Existing vegetation should be disturbed as little as possible during construction, and those areas that are disturbed should be revegetated as soon after construction as possible to reduce erosion.

This soil has severe limitations for local roads and streets because of low strength. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic.

This soil has severe limitations for septic tank absorption fields because of slow permeability. Landshaping and installing the distribution lines across the slope generally are necessary for proper functioning of the absorption field. Filling or mounding the absorption field with a more suitable fill material and elevating the field help to overcome the slow permeability.

This soil is in capability subclass IVe and woodland suitability subclass 2o.

MxE2—Morley silt loam, 18 to 30 percent slopes, eroded. This moderately steep and steep, deep, well drained soil is on till plains and moraines. Areas are long and narrow and dominantly about 8 acres.

Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsoil is yellowish brown and dark yellowish brown, firm clay loam about 23 inches thick. The underlying material to a depth of 60 inches is yellowish brown clay loam. In places the subsoil is thinner, and calcareous clay loam or silty clay loam is at a shallower depth. Slope is less than 18 percent or more than 30 percent in places. In some areas the surface layer is mainly material from the subsoil.

Included with this soil in mapping are small areas of somewhat poorly drained Blount soils and moderately well drained Glynwood soils on lower lying positions and excessively drained Chelsea soils on crests of hills and ridges. Also included are small areas of well drained Hennepin soils on steep side slopes and moderately well drained or well drained Rawson Variant soils on slight rises. The included soils make up 5 to 10 percent of the mapped areas.

This Morley soil has moderate available water capacity and is slowly permeable. Organic matter content in the surface layer is moderate. Surface runoff is rapid.

Most areas of this soil remain in woodland. Some areas are used for pasture, and some areas that were cleared are being reforested.

This soil is generally not suited to corn, soybeans, and small grains. Erosion is the main hazard in use and management. Most types of farm machinery are difficult to use because of the steep slopes.

This soil is suited to grasses and legumes for hay or pasture. Hay and pasture are effective in helping to control water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are suited to this soil. The main management concerns are erosion hazard, equipment limitation, and plant competition. Because of the erosion hazard and equipment limitation, roads, skid trails, and landings should be on gentle grades. Waterbars, outsloping road surfaces, culverts, and drop structures are needed to remove surface water. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

This soil is generally not suitable for building sites because of slope and is not suitable for septic tank absorption fields because of slope and slow permeability. It has severe limitations for local roads because of slope and low strength. Cutting and filling are needed, and roads should be built on the contour where possible. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic.

This soil is in capability subclass VIe and woodland suitability subclass 2r.

MzC3—Morley clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on till plains and moraines. Areas are irregular in shape and are dominantly about 10 acres.

Typically, the surface layer is brown clay loam about 4 inches thick. The subsoil is brown and dark yellowish brown, firm clay loam about 21 inches thick. The underlying material to a depth of 60 inches is yellowish brown clay loam. In places the subsoil is thinner, and calcareous clay loam or silty clay loam is at a shallower depth. Slope is less than 6 percent or more than 12 percent in places.

Included with this soil in mapping are small areas of somewhat poorly drained Blount soils and moderately well drained Glynwood soils on lower lying positions and excessively drained Chelsea soils on crests of hills and ridges. Also included are small areas of well drained Hennepin soils on steep side slopes and moderately well drained or well drained Rawson Variant soils on slight rises. The included soils make up 5 to 10 percent of the mapped areas.

This Morley soil has moderate available water capacity and is slowly permeable. The surface layer is moderately low in organic matter content. Surface runoff is medium. The surface layer is firm and has poor tilth (fig. 6).

Most areas of this soil are used for cultivated crops. Some areas are used for hay, pasture, or woodland.

This soil is poorly suited to corn, soybeans, and small grains. Erosion is the main hazard in use and management. Extensive conservation practices are needed to control erosion and surface runoff in cultivated cropland. Conservation tillage that leaves protective amounts of crop residue on the surface, diversions, terraces, contour farming, and grade stabilization structures help to reduce runoff and excessive soil loss. Conservation tillage and cover crops help to maintain tilth, moisture, and organic matter content of this soil. Proper crop rotations that include grasses and legumes for hay and pasture most of the time help to reduce runoff and control erosion.

This soil is well suited to grasses and legumes for hay or pasture. Hay and pasture are effective in helping to control erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil has moderate limitations for building sites because of shrink-swell and slope. Foundations,

Figure 6.—An area of Morley clay loam, 6 to 12 percent slopes, severely eroded. This soil is in poor tilth.

footings, and basement walls should be strengthened. Backfilling with a coarse material helps to prevent structural damage caused by the shrinking and swelling. Buildings need to be designed to complement the slope. Existing vegetation should be disturbed as little as possible during construction, and those areas that are disturbed should be revegetated as soon after construction as possible to reduce erosion.

This soil has severe limitations for local roads and streets because of low strength. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic.

This soil has severe limitations for septic tank absorption fields because of slow permeability. Landshaping and installing the distribution lines across the slope generally are necessary for proper functioning of the absorption field. Filling or mounding the absorption field with a more suitable fill material and elevating the field help to overcome the slow permeability.

This soil is in capability subclass IVe and woodland suitability subclass 2o.

MzD3—Morley clay loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on till plains and moraines. Areas are irregular in shape and dominantly about 8 acres.

Typically, the surface layer is brown clay loam about 6 inches thick. The subsoil is dark yellowish brown and yellowish brown, firm clay loam about 18 inches thick. The underlying material to a depth of 60 inches is brown clay loam. In places the subsoil is thinner, and calcareous clay loam or silty clay loam is at a shallower depth. Slope is less than 12 percent or more than 18 percent in places.

Included with this soil in mapping are small areas of somewhat poorly drained Blount soils and moderately well drained Glynwood soils on lower lying positions and excessively drained Chelsea soils on crests of hills and ridges. Also included are small areas of well drained Hennepin soils on steep side slopes and moderately well drained or well drained Rawson Variant soils on slight rises. The included soils make up 5 to 10 percent of the mapped areas.

This Morley soil has moderate available water capacity and is slowly permeable. The surface layer is moderately low in organic matter content. Surface runoff is rapid. The surface layer is firm and has poor tilth.

Most areas of this soil are used for hay or pasture. Some areas remain in woodland, and a few areas are used for cultivated crops.

This soil is generally not suited to corn, soybeans, and small grains. Erosion is the main hazard in use and management. Most types of farm machinery are difficult to use because of the steep slopes.

This soil is suited to grasses and legumes for hay or pasture. Using this soil for hay and pasture helps to control water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. The main management concern is plant competition. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

This soil has moderate limitations for building sites because of shrink-swell and slope. Foundations, footings, and basement walls should be strengthened. Backfilling with a coarse material helps to prevent structural damage caused by the shrinking and swelling. Buildings need to be designed to complement the slope. Existing vegetation should be disturbed as little as possible during construction, and those areas that are disturbed should be revegetated as soon after construction as possible to reduce erosion.

This soil has severe limitations for local roads and streets because of low strength. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic.

This soil has severe limitations for septic tank absorption fields because of slow permeability. Landshaping and installing distribution lines across the slope generally are necessary for proper functioning of the absorption field. Filling or mounding the absorption field with a more suitable fill material and elevating the field help to overcome the slow permeability.

This soil is in capability subclass VIe and woodland suitability subclass 2o.

OcA—Ockley loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on broad terraces and outwash plains along the valleys of major streams. Areas are elongated and range from 4 to 100 acres or more.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil is about 47 inches thick. The upper part is dark yellowish brown, friable fine sandy loam; the next part is brown, friable sandy loam; and the lower part is dark brown, friable gravelly sandy clay loam. The underlying material to a depth of 60 inches is light gray gravelly coarse sand. In places the subsoil and underlying material have more clay and less sand. Slopes are more than 2 percent in some areas. In places the depth to gravelly coarse sand is less than 40 inches or more than 60 inches. In some areas bedrock is within a depth of 60 inches.

Included with this soil in mapping are small areas of very poorly drained Rensselaer soils in depressions and somewhat poorly drained Whitaker soils on lower lying positions. Also included are small areas of well drained soils that have a stony or gravelly surface layer (fig. 7). The included soils make up 7 to 13 percent of the mapped areas.

This Ockley soil has moderate available water capacity and is moderately permeable. The organic matter content in the surface layer is moderate. Surface runoff is slow.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains. Conservation tillage that leaves protective amounts of crop residue on the surface and winter cover crops help to maintain and improve organic matter content and tilth.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. The main management concern is plant competition. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

This soil has moderate limitations for building sites because of shrink-swell. Foundations, footings, and basement walls should be strengthened. Backfilling with a coarse material helps to prevent structural damage caused by the shrinking and swelling.

This soil has severe limitations for local roads and streets because of low strength. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic. This soil is suitable for septic tank absorption fields.

This soil is in capability class I and woodland suitability subclass 1o.

OcB—Ockley loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on broad terraces and outwash plains along the valleys of major streams. Areas are elongated and range from 4 to 50 acres.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil is about 35 inches thick. The upper part is brown, friable loam; the next part is brown, firm clay loam and sandy clay loam; and the lower part is brown, firm gravelly clay loam. The underlying material to

Figure 7.—Small areas of stony surface on Ockley loam, 0 to 2 percent slopes, hinder farming operations.

a depth of 60 inches is yellowish brown gravelly coarse sand. In places the subsoil and underlying material have more clay and less sand. In places sand and gravel are at a shallower depth or are at a depth of more than 60 inches. Slope is less than 2 percent or more than 6 percent in places. In some areas bedrock is within a depth of 60 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Whitaker soils on lower lying positions and very poorly drained Rensselaer soils in depressions. Also included are small areas of well drained soils that have a stony to gravelly surface layer and soils in which the surface layer is mostly material from the subsoil. The included soils make up 7 to 13 percent of the mapped areas.

This Ockley soil has moderate available water capacity and is moderately permeable. The organic matter content in the surface layer is moderate. Surface runoff is medium.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains. Erosion is the main hazard in use and management. Crop rotation, cover crops, grassed waterways, grade stabilization structures, and conservation tillage that leaves protective amounts of crop residue on the surface help to prevent excessive soil loss. Conservation tillage and cover crops help to reduce crusting and compaction, preserve moisture, and improve infiltration, aeration, organic matter content, structure, and tilth.

This soil is well suited to grasses and legumes for hay or pasture. The hay and pasture are effective in helping to control water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. The main management concern is plant competition. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil has moderate limitations for building sites because of shrink-swell. Foundations, footings, and basement walls should be strengthened. Backfilling with a coarse material helps to prevent structural damage caused by the shrinking and swelling. Existing vegetation should be disturbed as little as possible during construction, and those areas that are disturbed should be revegetated as soon after construction as possible to reduce erosion.

This soil has severe limitations for local roads and streets because of low strength. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic. This soil is suitable for septic tank absorption fields.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

Pa—Patton silty clay loam. This nearly level, deep, poorly drained soil is on lake plains. It is ponded by surface runoff from adjacent higher lying soils. Areas are elongated and range from 20 to 100 acres or more.

Typically, the surface layer is very dark grayish brown silty clay loam about 8 inches thick. The subsoil is dark gray and gray, mottled, firm silty clay loam about 36 inches thick. The underlying material to a depth of 60 inches is gray, mottled silty clay loam and has strata of loam and clay loam. In places the subsoil and underlying material have less silt and more sand. Some areas are not drained and stay wet most of the year. Ten to 30 inches of loam or silt loam is on the surface in some areas. In places bedrock is within a depth of 60 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Aptakisic soils on slightly higher lying positions, excessively drained Chelsea soils on the crests of hills and ridges, and very poorly drained Houghton soils in depressions. The included soils make up 5 to 10 percent of the mapped areas.

This Patton soil has high available water capacity. Permeability is moderately slow. The organic matter content in the surface layer is high. Surface runoff is very slow or ponded. The seasonal high water table is at or above the surface.

Most areas of this soil are drained and used for cultivated crops. A few areas are used for hay or pasture. The undrained areas are commonly in woodland.

This soil is well suited to corn, soybeans, and small grains if adequately drained. Wetness is the main limitation in the use and management of this soil, and ponding is a hazard. Subsurface drains and shallow surface drains with adequate outlets can be used to remove the excess water. Conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to maintain and improve structure, tilth, and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture if adequately drained. Deep-rooted legumes, such as alfalfa, grow poorly in undrained areas of this soil because they cannot tolerate the high water table. Grazing or overgrazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are suited to this soil. The main management concerns are equipment limitation, seedling mortality, windthrow hazard, and plant competition. Harvesting of trees is generally timed to dry periods or to seasons of the year when the ground is frozen. Some replanting of seedlings is generally necessary. Species that tolerate wetness should be favored in stands. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

This soil is generally not suitable for building sites because of ponding and for septic tank absorption fields because of ponding and moderately slow permeability. It has severe limitations for local roads because of low strength, ponding, and frost action. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic. Constructing roads on raised, well compacted fill material and providing side ditches and culverts for adequate drainage help to protect the roads from ponding and frost damage.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

Pe—Patton silty clay loam, sandy substratum. This nearly level, deep, poorly drained soil is in depressions on lake plains. It is ponded by surface runoff from adjacent higher lying soils. Areas are irregular in shape and range from 3 to 500 acres or more.

Typically, the surface soil is black and very dark gray silty clay loam about 18 inches thick. The subsoil is gray, mottled, firm silty clay loam about 29 inches thick. The underlying material to a depth of 60 inches is gray, mottled fine sandy loam in the upper part; brownish yellow, mottled fine sand in the next part; and olive brown, mottled clay loam in the lower part. In areas calcareous material is at a shallower depth. In places 10 to 30 inches of silt loam or loam is on the surface. Some undrained areas stay wet most of the year (fig. 8). The underlying material has less sand and more clay in places. In places the subsoil has less silt and more sand. In some areas bedrock is within a depth of 60 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Aptakisic soils on slightly higher lying positions and very poorly drained Houghton

Figure 8.—An undrained depression in an area of poorly drained Patton silty clay loam, sandy substratum. These depressions are too wet to be farmed in most years.

soils in depressions. The included soils make up 10 to 13 percent of the mapped areas.

This Patton soil has high available water capacity. Permeability is moderately slow. The organic matter content in the surface layer is high. Surface runoff is very slow or ponded. The seasonal high water table is at or above the surface.

Most areas of this soil are drained and used for cultivated crops. A few areas are used for hay or pasture. The undrained areas commonly are in woodland.

This soil is well suited to corn, soybeans, and small grains if adequately drained. Wetness is the main limitation in the use and management of this soil, and ponding is a hazard. Subsurface d-ains and shallow surface drains with adequate outlets can be used to remove excess water. If subsurface drains are installed below a depth of 40 inches, there is a danger of hitting layers of fine sand that could flow into the tile and plug it. Conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to maintain and improve structure, tilth, and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture if adequately drained. Deep-rooted legumes, such as alfalfa, grow poorly in undrained areas of this soil because they cannot tolerate the high water table. Grazing or overgrazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are suited to this soil. The main management concerns are equipment limitation, seedling mortality, windthrow hazard, and plant competition. Harvesting of trees is generally timed to dry periods or to seasons of the year when the ground is frozen. Some replanting of seedlings is usually necessary. Species that tolerate wetness should be favored in stands. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

This soil is generally not suitable for building sites because of ponding and for septic tank absorption fields because of ponding and moderately slow permeability. It has severe limitations for local roads because of low strength, ponding, and frost action. The base material for roads needs to be strengthened or replaced with a more suitable material to support vehicular traffic. Constructing roads on raised, well compacted fill material and providing side ditches and culverts for adequate drainage help to protect the roads from ponding and frost damage.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

Pg—Pewamo silty clay loam. This nearly level, deep, very poorly drained soil is in depressions on till plains and moraines. At times it is ponded with surface runoff from adjacent higher lying soils. Areas are irregular in shape and range from 5 to 300 acres or more.

Typically, the surface soil is very dark gray silty clay loam about 12 inches thick. The subsoil is dark gray and gray, mottled, firm silty clay loam about 24 inches thick. The underlying material to a depth of 60 inches is gray, mottled silty clay loam. In places the dark surface soil is less than 10 inches thick. Some undrained areas stay wet most of the year. In places 10 to 30 inches of silt loam or loam is on the surface. The subsoil has more silt and less clay in places. In some areas the subsoil and underlying material have more sand and less clay.

Included with this soil in mapping are small areas of somewhat poorly drained Blount soils and Haskins Variant soils on slightly higher lying positions, moderately well drained Glynwood soils on higher lying positions, and very poorly drained Houghton soils in depressions. The included soils make up 8 to 10 percent of the mapped areas.

This Pewamo soil has high available water capacity. Permeability is moderately slow. The organic matter content in the surface layer is high. Surface runoff is very slow or ponded. The seasonal high water table is at or above the surface.

Most areas of this soil are drained and used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains if adequately drained (fig. 9). Wetness is the main limitation in use and management of this soil, and ponding is a hazard. Subsurface drains and shallow surface drains with adequate outlets can be used to remove the excess water. Conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to maintain and improve organic matter content and maintain good structure and tilth.

This soil is well suited to grasses for hay or pasture if adequately drained. Deep-rooted legumes, such as alfalfa, do poorly in undrained areas of this soil because they cannot tolerate the high water table. Grazing or overgrazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are suited to this soil. The main management concerns are equipment limitation, seedling mortality, windthrow hazard, and plant competition. Harvesting of trees is generally timed to dry periods or to seasons of the year when the ground is frozen. Some replanting of seedlings is usually necessary. Species that tolerate wetness should be favored in stands. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

This soil is generally not suitable for building sites because of ponding and for septic tank absorption fields because of ponding and moderately slow permeability. It has severe limitations for local roads because of low strength, ponding, and frost action. The base material for roads needs to be strengthened or replaced with a more suitable material to support vehicular traffic. Constructing roads on raised, well compacted fill material and providing side ditches and culverts for adequate drainage help to protect the roads from ponding and frost damage.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

Px—Pits, gravel. This miscellaneous area is nearly level to steep and well drained. It is on uplands, terraces, outwash plains, and bottom lands. Areas are irregular in shape and range from 2 to 40 acres (fig. 10).

Included with the pits in mapping are small areas that consist of piles of overburden, small areas on uplands in which all the gravel has been removed and the till is exposed, and small water areas in the bottom of the pits. The inclusions make up 10 to 15 percent of the mapped areas.

The soil material in pits is generally low in content of organic matter. It is moderately alkaline. Surface runoff is variable. Erosion is a hazard.

Most areas of this unit are idle. They do not support vegetation, or they support only sparse vegetation. Some areas are presently being mined for gravel.

Pit areas are generally not suitable for cultivated crops, hay, or pasture. Suitability of the areas for woodland, building sites, or recreation is variable. Before these areas can be developed for other uses, onsite investigation is needed. Major land reclamation is generally rquired.

This miscellaneous area is not assigned to a capability subclass or woodland suitability subclass.

Py—Pits, quarry. This miscellaneous area is nearly level to steep. It is on shelves of hard dolomite and limestone bedrock. Areas were formerly Randolph soils

Figure 9.—Subsurface drains are installed to improve productivity in Pewamo silty clay loam.

and Millsdale soils. They are irregular in shape and range from 2 to 40 acres.

Typically, the soil has been removed from the pits to expose the bedrock. In places, soil material has washed back into the pit. The outer edges of the pits have steep side slopes, or they are vertical in many areas.

Included with the pits in mapping are small areas that consist of piles of overburden. Also included are small water areas in the bottom of the pits. The inclusions make up 2 to 10 percent of the mapped areas.

In areas of pits, surface runoff is variable. Bedrock is exposed over most of the surface. Areas that contain piles of overburden support vegetation. Quarries that are not in operation support sparse vegetation.

Most areas of this unit are used for mining limestone that is used as aggregate for roads and as a source of agricultural lime. The areas that are not mined are generally not suitable for cultivated crops, hay, pasture, woodland, building sites, or recreation. Before these areas can be developed for other uses, onsite investigation is needed and major land reclamation is generally required.

This miscellaneous area is not assigned to a capability subclass or woodland suitability subclass.

RcA—Randolph loam, 0 to 2 percent slopes. This nearly level, moderately deep, somewhat poorly drained soil is on uplands. It is underlain by dolomite and limestone bedrock. Areas are irregular in shape and range from 3 to 40 acres.

Typically, the surface soil is brown loam about 15 inches thick. The subsoil is grayish brown, mottled, firm clay loam about 10 inches thick. Very pale brown, hard dolomite bedrock is at a depth of about 25 inches. In places the depth to bedrock is more than 40 inches. In places this soil is underlain by soft siltstone.

Included with this soil in mapping are small areas of very poorly drained Millsdale soils in depressions and well drained Milton soils on higher lying positions. Also included are small areas where the bedrock is exposed at the surface and small areas that have a stony to channery surface layer. The included soils make up 6 to 10 percent of the mapped areas.

This Randolph soil has low available water capacity. Permeability is moderately slow. The organic matter content in the surface layer is moderate. Surface runoff is slow. The seasonal high water table is at a depth of 1 foot to 2.5 feet. Root development is restricted below a depth of about 25 inches.

Most areas of this soil are drained and used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains if adequately drained. Wetness is the main limitation in use and management. Subsurface drains or shallow surface drains with adequate outlets can be used to remove excess water. In some areas the depth to bedrock may interfere with the installation of subsurface drains. Conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help improve and maintain structure, tilth, and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. Deep-rooted legumes, such as alfalfa, grow poorly in undrained areas of this soil because they

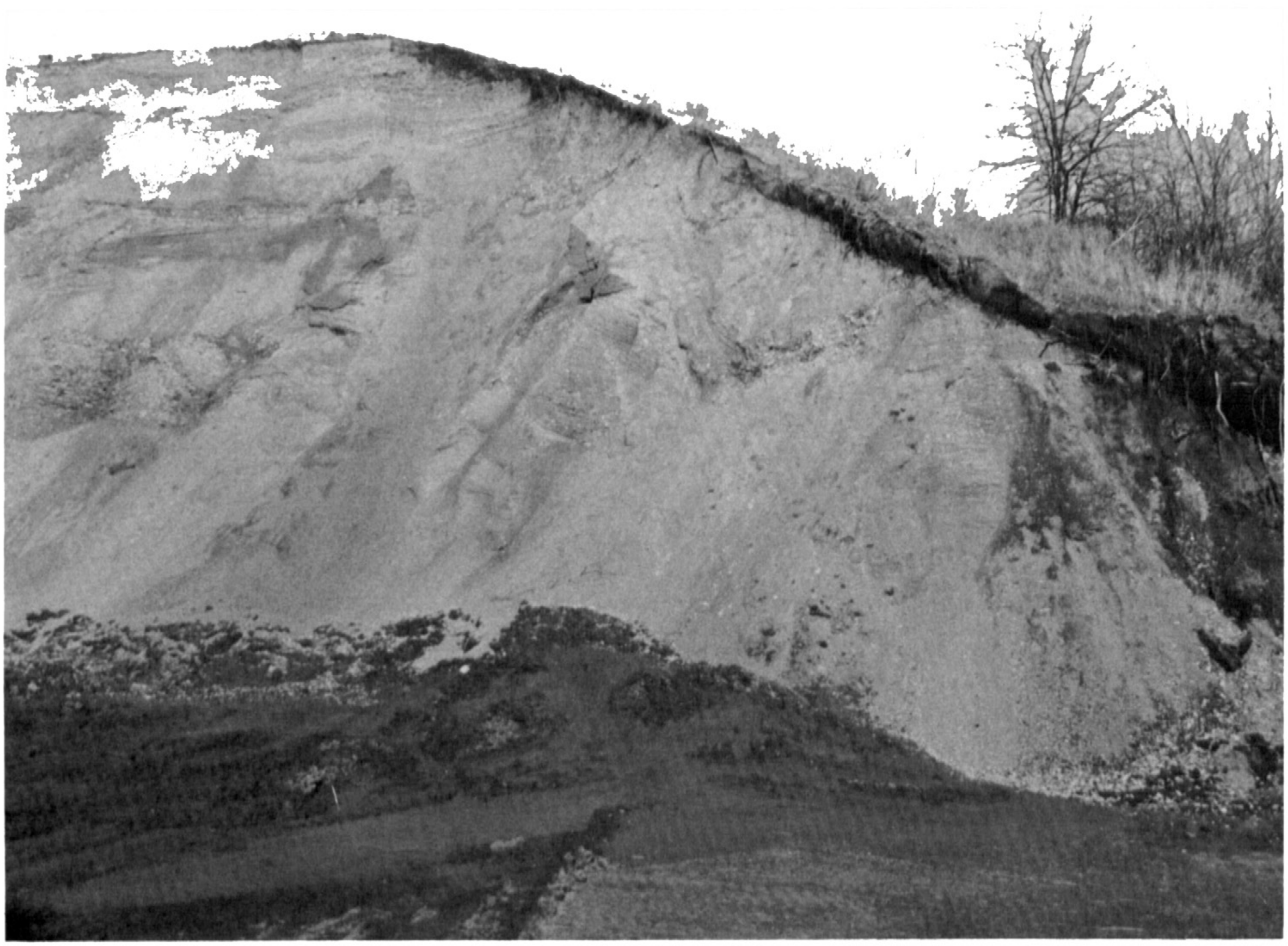


Figure 10.—An area of Pits, gravel, used as a source of sand and gravel. Originally this area was Fox or Ockley soils.

cannot tolerate the high water table. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

This soil is generally not suitable for building sites because of wetness and depth to rock. It is not suitable for septic tank absorption fields because of wetness, depth to rock, and moderately slow permeability. This soil has severe limitations for local roads because of low strength and frost action. The base material for roads needs to be strengthened or replaced with a more suitable material to support vehicular traffic. Providing adequate drainage along roads helps to reduce the possibility of frost action.

This soil is in capability subclass IIIw and woodland suitability subclass 3o.

RgB—Rawson Variant fine sandy loam, 2 to 6 percent slopes. This gently sloping, deep, moderately well drained or well drained soil is on convex rises on till plains. Areas are irregular in shape and range from 2 to 50 acres.

Typically, the surface layer is brown fine sandy loam about 10 inches thick. The subsoil is about 31 inches thick. It is yellowish brown, friable fine sandy loam and sandy loam in the upper part; dark yellowish brown, friable fine sandy loam in the middle part; and dark yellowish brown, firm clay loam in the lower part. The underlying material to a depth of 60 inches is yellowish brown clay loam. In places slope is more than 6 percent. Some areas have a loamy sand or sand surface soil.

Included with this soil in mapping are small areas of somewhat poorly drained Blount soils and Haskins Variant soils on lower lying positions, moderately well drained Glynwood soils on slightly lower lying positions, and well drained Morley soils on narrow, steeper slopes along drainageways. Also included are small areas that are not drained and stay wet most of the year and small areas in which the surface layer consists mainly of material from the subsoil. The included soils make up 10 to 12 percent of the mapped areas.

This Rawson Variant soil has moderate available water capacity. It is moderately permeable in the surface layer and upper part of the subsoil and slowly permeable in the lower part of the subsoil and underlying material. The surface layer is moderate in organic matter content. Surface runoff is medium. The seasonal high water table is at a depth of 3 to 6 feet.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains. Erosion is the main hazard in use and management. Crop rotation, cover crops, grassed waterways, grade stabilization structures, and conservation tillage that leaves protective amounts of crop residue on the surface help to prevent excessive soil loss. Conservation tillage and cover crops help to reduce crusting and compaction, preserve moisture, and improve infiltration, aeration, organic matter content, structure, and tilth.

This soil is well suited to grasses and legumes for hay or pasture. Using this soil for hay or pasture helps to control water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil is suitable for dwellings without basements. It has moderate limitations for dwellings with basements because of wetness. The installation of subsurface drains helps to lower the water table. Existing vegetation should be disturbed as little as possible during construction, and those areas that are disturbed should be revegetated as soon after construction as possible to reduce erosion.

This soil has moderate limitations for local roads and streets because of frost action. Constructing roads and streets on well compacted fill material and providing side ditches and culverts for adequate drainage help to protect the roads and streets from frost damage.

This soil has severe limitations for septic tank absorption fields because of wetness and slow permeability. The installation of subsurface drains around the outer edge of the absorption field helps to remove the excess water. Filling or mounding the absorption field with a more suitable fill material and elevating the field help to overcome the slow permeability.

This soil is in capability subclass IIe and woodland suitability subclass 2o.

RgC—Rawson Variant fine sandy loam, 6 to 12 percent slopes. This moderately sloping, deep, moderately well drained or well drained soil is on convex rises on till plains. Areas are irregular in shape and range from 2 to 25 acres.

Typically, the surface soil is brown fine sandy loam about 13 inches thick. The subsoil is 29 inches thick. The upper part is brown, friable fine sandy loam and sandy loam; the next part is dark yellowish brown, friable loam; and the lower part is yellowish brown, firm clay loam. The underlying material to a depth of 60 inches is yellowish brown clay loam. In places slope is less than 6 percent or more than 12 percent. Some areas have a loamy sand or sand surface soil.

Included with this soil in mapping are small areas of somewhat poorly drained Blount soils and Haskins Variant soils on lower lying positions, moderately well drained Glynwood soils on slightly lower lying positions, and well drained Morley soils on narrow, steeper slopes along drainageways. Also included are small areas in which the surface layer is mainly material from the subsoil. The included soils make up 10 to 12 percent of the mapped areas.

This Rawson Variant soil has moderate available water capacity. It is moderately permeable in the surface layer and upper part of the subsoil and slowly permeable in the lower part of the subsoil and underlying material. The surface layer is moderate in organic matter content. Surface runoff is medium. The seasonal high water table is at a depth of 3 to 6 feet.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is suited to corn, soybeans, and small grains. Erosion is the main hazard in use and management. Conservation practices help to control erosion and surface runoff in cultivated cropland. Crop rotation, conservation tillage that leaves protective amounts of crop residue on the surface, diversions, contour farming, terraces, and grade stabilization structures help to reduce runoff and excessive soil loss. Conservation tillage and cover crops help to maintain and improve moisture, tilth, and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. Hay and pasture are effective in helping to control water erosion on this soil. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil has moderate limitations for building sites because of slope and wetness. Buildings need to be designed to complement the slope. The installation of subsurface drains helps to lower the water table. Existing vegetation should be disturbed as little as possible during construction, and those areas that are disturbed should be revegetated as soon after construction as possible to reduce erosion.

This soil has moderate limitations for local roads and streets because of slope and frost action. Constructing local roads and streets on the contour and landshaping help to overcome the slope limitation. Constructing roads and streets on well compacted fill material and providing side ditches and culverts for adequate drainage help to protect the roads and streets from frost action.

This soil has severe limitations for septic tank absorption fields because of wetness and slow permeability. Landshaping and installing the distribution lines across the slope generally are necessary for proper functioning of the absorption field. Filling or mounding the absorption field with a more suitable fill material and elevating the field help to overcome the slow permeability. Installing subsurface drains around the outer edge of the absorption field helps to remove the excess water.

This soil is in capability subclass IIIe and woodland suitability subclass 2o.

Rk—Rensselaer loam. This nearly level, deep, very poorly drained soil is on low lying terraces and outwash plains. It is ponded by surface runoff from adjacent higher lying soils. Areas are irregular in shape and range from 3 to 60 acres.

Typically, the surface soil is very dark grayish brown loam and silt loam about 14 inches thick. The subsoil is about 32 inches thick. The upper part is dark gray, mottled, friable silt loam; the next part is dark gray and grayish brown, mottled, firm clay loam; and the lower part is gray, mottled, friable loam. The underlying material to a depth of 60 inches is gray, mottled loam and has strata of sandy loam and fine sandy loam. Some areas that are not drained stay wet most of the year. In places the subsoil and underlying material have less sand and more clay, and in places the subsoil has more silt and less sand. Some areas have 10 to 30 inches of deposition on the surface. Bedrock is within a depth of 60 inches in places.

Included with this soil in mapping are small areas of somewhat poorly drained Aptakisic and Whitaker soils on slightly higher lying positions, excessively drained Chelsea soils on the crests of hills and ridges, and well drained Fox and Ockley soils on higher lying positions. Also included are small areas of well drained Martinsville soils on slight rises. The included soils make up 8 to 12 percent of the mapped areas.

This Rensselaer soil has high available water capacity and is moderately permeable. It has high organic matter content in the surface layer. Surface runoff is very slow or ponded. The seasonal high water table is at or above the surface.

Most areas of this soil are drained and used for cultivated crops. A few areas are used for hay or pasture. The undrained areas are commonly in woodland.

This soil is well suited to corn, soybeans, and small grains if adequately drained. Wetness is the main limitation, and ponding is a hazard in the use and management of this soil. Excessive water can be removed by subsurface drains and shallow surface drains that have adequate outlets. If subsurface drains are installed below a depth of 40 inches, there is a hazard of hitting layers of fine sand that could flow into the tile and plug it. Conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to improve structure and tilth and to maintain the organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture if adequately drained. Deep-rooted legumes, such as alfalfa, grow poorly in undrained areas of this soil because they cannot tolerate the high water table. Grazing or overgrazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are suited to this soil. The main management concerns are equipment limitation, seedling mortality, windthrow hazard, and plant competition. Harvesting of trees is generally timed to dry periods or to seasons of the year when the ground is frozen. Some replanting of seedlings is generally necessary. Species that tolerate wetness should be favored in stands. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

This soil is generally not suitable for building sites and septic tank absorption fields because of ponding. It has severe limitations for local roads because of low strength, ponding, and frost action. The base material for roads needs to be strengthened or replaced with a more suitable material to support vehicular traffic. Constructing roads on raised, well compacted fill material and providing side ditches and culverts for adequate drainage help to protect the roads from ponding and frost damage.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

Sh—Shoals silt loam, occasionally flooded. This nearly level, deep, somewhat poorly drained soil is on flood plains. It is subject to occasional flooding of brief duration from October to June. Areas are irregular in shape and range from 5 to 100 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is dark grayish brown, mottled, friable silt loam about 7 inches thick. The underlying material to a depth of 60 inches is dark grayish brown, mottled loam in the upper part; brown, mottled loam with thin strata of sandy loam in the next part; and dark gray, mottled sandy loam and gravelly sandy loam in the lower part. Some areas have a silty clay loam surface layer. In places sand and gravel are below a depth of 50 inches. The surface layer and upper part of the underlying material have more sand or silt in places. Bedrock is within a depth of 60 inches in some areas.

Included with this soil in mapping are small areas of moderately well drained Eel soils on slightly lower lying positions, well drained Genesee soils on higher lying positions, and very poorly drained Sloan soils in depressions. The included soils make up 8 to 10 percent of the mapped areas.

This Shoals soil has high available water capacity and is moderately permeable. The organic matter content in the surface layer is moderate. Surface runoff is very slow. The seasonal high water table is at a depth of 1 foot to 3 feet.

Most areas of this soil are drained and used for cultivated crops. A few areas are in hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation in the use and management of this soil, and occasional flooding is a hazard. Subsurface drains and shallow surface drains with adequate outlets can be used to remove the excess water. Late planting or replanting is sometimes necessary because of flooding in the spring. Conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to maintain and improve organic matter content and to maintain good structure and tilth.

This soil is well suited to grasses and legumes for hay or pasture if adequately drained. Deep-rooted legumes, such as alfalfa, grow poorly in undrained areas of this soil because they cannot tolerate the high water table. Grazing or overgrazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil is generally not suitable for building sites and septic tank absorption fields because of flooding and wetness. It has severe limitations for local roads because of flooding and frost action. Constructing roads on raised, well compacted fill material and providing ditches and culverts for adequate drainage help to protect the roads from flood and frost damage.

This soil is in capability subclass IIw and woodland suitability subclass 2o.

Sm—Sloan silt loam, frequently flooded. This nearly level, deep, very poorly drained soil is on flood plains. It is subject to frequent flooding of brief duration from October to June. Areas are elongated and dominantly about 10 acres.

Typically, the surface soil is very dark gray and very dark grayish brown silt loam about 14 inches thick. The subsoil is dark grayish brown, mottled, friable loam about 20 inches thick. The underlying material to a depth of 60 inches is dark grayish brown, mottled silt loam and loam. In places areas are flooded for long periods. Sand and gravel is below a depth of 50 inches in places. In some areas bedrock is within a depth of 60 inches.

Included with this soil in mapping are small areas of moderately well drained Eel soils on slightly lower lying positions and well drained Genesee soils and somewhat poorly drained Shoals soils on higher lying positions. The included soils make up 6 to 10 percent of the mapped areas.

This Sloan soil has high available water capacity. Permeability is moderately slow. Organic matter content in the surface layer is high. The surface runoff is very slow. The seasonal high water table is at or near the surface.

Most areas of this soil are used for grasses and legumes for hay or pasture or are in woodland. Some areas are used for cultivated crops.

This soil is suited to corn, soybeans, and small grains. Wetness is the main limitation in the use and management of this soil, and frequent flooding is a hazard. Subsurface drains and shallow surface drains that have adequate outlets can be used to remove the excess water. Late planting or replanting is sometimes necessary because of brief duration flooding in spring. Conservation tillage that leaves protective amounts of crop residue on the surface, tillage at the proper moisture content, and cover crops help to maintain and improve organic matter content, structure, and tilth.

This soil is well suited to grasses and legumes for hay or pasture if adequately drained. Deep-rooted legumes, such as alfalfa, grow poorly in undrained areas of this soil because they cannot tolerate the high water table. Grazing or overgrazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are suited to this soil. The main management concerns are equipment limitation, seedling mortality, windthrow hazard, and plant competition. Harvesting of trees is generally timed to dry periods or to seasons of the year when the ground is frozen. Some replanting of seedlings is generally necessary. Species that tolerate wetness should be favored in stands. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

This soil is generally not suitable for building sites because of flooding and wetness and for septic tank absorption fields because of flooding, wetness, and moderately slow permeability. It has severe limitations for local roads because of low strength, wetness, flooding, and frost action. The base material for roads needs to be strengthened or replaced with a more suitable material to support vehicular traffic. Constructing roads on raised, well compacted fill material and providing side ditches and culverts for adequate drainage help to protect the roads from flooding, wetness, and frost damage.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

Ud—Udorthents, loamy. These nearly level to steep, somewhat poorly drained to well drained soils are on uplands. They consist of borrow areas that are used as cover for sanitary landfills and low areas that have been filled and leveled. Areas are irregular in shape and range from 3 to 40 acres.

Typically, the soil to a depth of 60 inches is brown or yellowish brown loamy material that has been moved and greatly altered.

Included with these soils in mapping are small areas of soils that are wet during part or all of the year and soils along the major drainageways that are occasionally flooded. The included soils make up 10 to 15 percent of the mapped areas.

These soils have low to moderate available water capacity and are slowly permeable to moderately permeable. They have very low organic matter content and poor tilth. Surface runoff is slow to rapid. These soils are difficult to reclaim. Revegetation and erosion control are extremely difficult (fig. 11).

Most areas of these soils are idle and support little or no vegetation. Some areas are used for building sites and road construction sites. A few areas are vegetated and used as wildlife habitat.

Suitability of these soils for cropland, pasture, woodland, building site development, or recreation varies greatly. For the various uses, onsite investigation is needed on these soils to determine practices necessary to overcome the hazards, limitations, and concerns in management.

These soils are not assigned to a capability subclass or a woodland suitability subclass.

Wo—Whitaker loam. This nearly level, deep, somewhat poorly drained soil is on terraces and outwash plains. Areas are irregular in shape and range from 3 to 50 acres.

Typically, the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is about 30 inches thick. It is yellowish brown, mottled, friable loam in the upper part and yellowish brown and brown, mottled, firm clay loam in the lower part. The underlying material to a depth of 60 inches is yellowish brown, mottled loam. It has thin strata of clay loam in the upper part and pale brown, mottled clay loam with thin strata of loam and sandy loam in the lower part. More silt and less sand are in the subsoil in places. Some areas have a loamy sand surface layer. In places bedrock is within a depth of 60 inches.

Included with this soil in mapping are small areas of well drained Fox and Ockley soils on higher lying positions, well drained Martinsville soils on slight rises, and very poorly drained Rensselaer soils in depressions. Also included are small areas that have a stony to gravelly surface layer and small areas that are not

Figure 11.—An area of Udorthents, loamy, used as a source of roadfill. These soils are in poor tilth and have sparse vegetation. Management is difficult.

drained and are wet most of the year. The included soils make up 7 to 10 percent of the mapped areas.

This Whitaker soil has high available water capacity and is moderately permeable. The organic matter content in the surface layer is moderate. Surface water runoff is slow. The seasonal high water table is at a depth of 1 foot to 3 feet.

Most areas of this soil are drained and used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains if adequately drained. Wetness is the main limitation in use and management. Subsurface drains with adequate outlets can be used to remove excess water. If subsurface drains are installed below a depth of 40 inches, there is a hazard of hitting layers of fine sand that could flow into the tile and plug it. Conservation tillage that leaves protective amounts of crop residue on the surface and cover crops help to maintain and improve structure, tilth, and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture if adequately drained. Deep-rooted legumes, such as alfalfa, grow poorly in undrained areas of this soil because they cannot tolerate the high water table. Grazing or overgrazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Trees are well suited to this soil. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

This soil has severe limitations for building sites because of wetness. The installation of subsurface drains helps to lower the water table.

This soil has severe limitations for local roads and streets because of low strength and frost action. The base material for roads and streets needs to be strengthened or replaced with a more suitable material to support vehicular traffic. Providing adequate drainage for roads and streets helps to reduce the possibility of frost action.

This soil has severe limitations for septic tank absorption fields because of wetness. The installation of subsurface drains around the outer edge of the absorption field helps to remove the excess water.

This soil is in capability subclass IIw and woodland suitability subclass 3o.

prime farmland

Prime farmland is one of several kinds of important farmlands defined by the U. S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited, and the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our Nation's prime farmland with wisdom and foresight.

Prime farmland, as defined by the U. S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops. If it is properly treated and high level management and acceptable farming methods are used, prime farmland produces the highest yields with minimal inputs of energy and economic resources, and its use results in the least damage to the environment.

Prime farmland in Huntington County can be in cropland, pastureland, woodland, or other land uses, but not in urban land, built-up land, or water areas. It must either be used for producing food or fiber or be available for these uses.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. It also has favorable temperature and growing season and acceptable acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. For more detailed information on the criteria for prime farmland, consult the local staff of the Soil Conservation Service.

About 218,000 acres, or nearly 87 percent, of Huntington County meets the soil requirements for prime farmland. Areas of prime farmland are scattered throughout the county. Nearly all of this land is used for the production of corn and soybeans.

Some parts of the county have been losing prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and difficult to cultivate, and are generally less productive.

Soil map units that make up prime farmland in Huntington County are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 5. The location is shown on the detailed soil maps in the back of this publication. The soil qualities that affect use and management are described in the section "Detailed soil map units."

Soils that have limitations—a high water table, flooding, or inadequate rainfall—qualify for prime farmland only in areas where these limitations are overcome by such measures as drainage, flood control, or irrigation. In the following list, the measures used to overcome these limitations are shown in parentheses after the map unit name. Onsite evaluation is necessary to see if the limitations have been overcome by corrective measures.

The map units that meet the soil requirements for prime farmland are:

ApA	Aptakisic silt loam, 0 to 2 percent slopes (where drained)
BcB2	Blount silt loam, 1 to 4 percent slopes, eroded (where drained)
Ee	Eel silt loam, occasionally flooded
FoA	Fox loam, 0 to 2 percent slopes
FoB	Fox loam, 2 to 6 percent slopes
Ge	Genesee silt loam, occasionally flooded
GlB2	Glynwood silt loam, 3 to 7 percent slopes, eroded
HcA	Haskins Variant fine sandy loam, 1 to 4 percent slopes (where drained)
McA	Martinsville silt loam, 0 to 2 percent slopes
McB	Martinsville silt loam, 2 to 8 percent slopes
Ms	Millsdale silty clay loam (where drained)
MtA	Milton silt loam, 0 to 2 percent slopes
MtB	Milton silt loam, 2 to 6 percent slopes
OcA	Ockley loam, 0 to 2 percent slopes
OcB	Ockley loam, 2 to 6 percent slopes
Pa	Patton silty clay loam (where drained)
Pe	Patton silty clay loam, sandy substratum (where drained)
Pg	Pewamo silty clay loam (where drained)
RcA	Randolph loam, 0 to 2 percent slopes (where drained)
RgB	Rawson Variant fine sandy loam, 2 to 6 percent slopes
Rk	Rensselaer loam (where drained)
Sh	Shoals silt loam, occasionally flooded (where drained)
Wo	Whitaker loam (where drained)

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

C. R. McCallister, soil conservationist, and Joe R. Pedon, conservation agronomist, Soil Conservation Service, assisted in the preparation of this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 159,059 acres of the county was in cropland in 1974 (*5*). Of this total, 124,218 acres was used for corn and soybeans; 13,259 acres was used for wheat; and 6,605 acres was used for hay.

The potential of the soils in Huntington County for increased crop production is fair. About half of the 17,314 acres of woodland and a portion of the pastureland could be converted to use for crop production. Crop production from present cropland acres could be increased by utilizing the latest technology on all cropland in the county.

Acreage in crops and pasture has been decreasing as more land is used for urban development. According to estimates from the Conservation Needs Inventory, there was 11,200 acres in urban land in 1967. Areas of the county which are experiencing the most rapid urban development include Jackson and Huntington Townships.

Soil drainage is the major soil problem on about 70 percent of the cropland and pasture in Huntington County. In most areas, very poorly drained soils, such as Pewamo, Millsdale, and Rensselaer soils, are satisfactorily drained for use as cropland. A few areas of these soils cannot be economically drained, because they are in deep depressions and suitable outlets are not readily available. The somewhat poorly drained soils, such as Blount, Haskins Variant, Randolph, Aptakisic, and Whitaker soils, also require artificial drainage. Tillage operations, germination of seeds, and plant growth are adversely affected unless the excess water is removed from these soils.

Morley, Fox, and Milton soils have good natural drainage, but in places they dry out slowly after rains. Small areas of wet soils along drainageways and in swales are commonly included with these soils in mapping. Artificial drainage is needed in some of these areas to prevent delays in farming operations.

Subsurface drainage is the main method of removing excess water. Spacing of subsurface drains must be adjusted to allow for the differences in permeability of the soils. In some areas, deep open ditches provide adequate outlets for subsurface drains.

Soil erosion is a concern on about 53 percent of the cropland and pastureland in Huntington County. If the slope is more than 2 percent, erosion can be a hazard.

Loss of topsoil is economically important for several reasons. Productivity is reduced as the surface layer is lost and more of the subsoil is mixed into the plow layer. The subsoil of most of the soils is higher in clay content and lower in organic matter content than the original surface layer. With the increase in clay content, the plow layer stays wet longer after a rain, and field operations are delayed. Also, the plow layer tends to be cloddy and to form a poor seedbed, and possible surface crusting increases, which creates a problem with plant emergence. More power is required to perform the same tillage operations in the eroded soils than in the noneroded soils. In pasture areas, the eroded soils compact more readily, and to establish a stand of grasses and legumes is more difficult. Soil erosion can result in sediment entering subsurface drains, creeks, and streams. This sediment obstructs the flow of subsurface drains and outlets and reduces the effectiveness of the drainage system. Sediment entering streams and waterways can also contain chemical fertilizers and pesticides that reduce the water quality for municipal use, recreation, and wildlife.

Effective erosion control practices provide a good surface cover, reduce runoff, and increase infiltration. A cropping system that includes a row crop no more than 2 years out of 5 should maintain a surface cover on the soil most of the time. If legumes are used as forage crops in the cropping system, they help to provide nitrogen and improve tilth for the following crop.

Conservation tillage and reduced tillage that leave crop residue on the surface help to increase infiltration and reduce the hazards of runoff and erosion. These practices are better adapted to well drained soils that have less than 12 percent slope and that dry out and warm up more quickly in spring. Examples are the Chelsea, Fox, Martinsville, Milton, Morley, Ockley, and Rawson Variant soils. No tillage helps to reduce erosion in corn cropland. This method of farming requires high levels of management and relies on herbicides and insecticides for weed and pest control.

Contour tillage and terraces are effective in helping to control erosion. Diversions and parallel tile outlet terraces shorten the effective length of slopes and reduce erosion. They are most practical on deep, well drained soils that are highly susceptible to erosion.

Grassed waterways are used on sloping to nearly level soils. They are used on sloping soils to reduce the velocity of runoff and, thereby, increase infiltration and prevent the formation of gullies. Grassed waterways can be used to stabilize previously eroded areas that have been reshaped and reseeded. Grassed waterways are installed on nearly level soils where a large watershed drains across these soils. Subsurface drains are generally installed below the waterway to reduce the amount of surface water carried by the waterway. This effectively alters an intermittent drainageway so that it can be easily crossed by tillage equipment.

Grade stabilization structures help to reduce erosion where surface water drains into an open ditch by reducing the velocity of the water and protecting the sides and bottom of the ditch. These structures are commonly used at the outlets and inlets of grassed waterways.

Wind erosion can be a potential hazard to some soils in Huntington County. It can occur on the dark colored mineral and muck soils when they are fall plowed. Maintaining a vegetative cover, surface mulch, or a rough surface through proper tillage helps to minimize wind erosion.

Soil fertility is naturally low in most soils on uplands and terraces in Huntington County. The soils on flood plains, such as Genesee, Eel, Shoals, and Sloan soils, are slightly higher in natural fertility. In most areas, fertility of the soils is quite variable because of differences in past fertilizing and management practices. Additions of lime and fertilizer should be based on soil tests and crop planting intentions.

Soil tilth is an important factor in the germination of seeds and workability of the soil. Many of the soils in Huntington County have a loam or silt loam surface layer that contains a moderate amount of organic matter. These soils form a thin crust on the surface after intense rainfall. The dark colored Pewamo and Patton soils have a silty clay loam surface layer and are more difficult to till, especially if wet. Despite the high content of organic matter in the surface layer of the Pewamo and Patton soils, they form clods if tilled when wet. The severely eroded soils have a clay loam surface layer and are difficult to till. Preparation of a good seedbed in these soils is difficult, and fall plowing is not good management because of the susceptibility to erosion.

Corn, soybeans, wheat, and oats are the main field crops in Huntington County. The common legumes are alfalfa and red clover. Grasses for hay and pasture include bluegrass, orchardgrass, bromegrass, timothy, and tall fescue.

Pasture management is important on soils in the county. Good management, such as pasture rotation, proper stocking, timely deferment of grazing, and restricted use during wet periods, help to keep the pasture and soil in good condition. Grazing or overgrazing when the soil is too wet causes surface compaction and poor tilth.

Specialty crops occupy a limited acreage in the county. They include popcorn, tomatoes, strawberries, nursery plants, and fruit trees. Deep, well drained soils, such as Ockley and Martinsville soils, are well suited to many vegetables and small fruits. Most of the well drained soils are suitable for orchards and nursery plants.

The latest information and guides for growing specialty crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Mitchell G. Hassler, forester, Soil Conservation Service, assisted in the preparation of this section.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops.

Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates high productivity; 2, moderately high; 3, moderate; 4, moderately low; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service, the Indiana Department of Natural Resources, Division of Forestry, or the Cooperative Extension Service or from a nursery.

recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

James D. McCall, biologist, Soil Conservation Service, assisted in the preparation of this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, soybeans, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are timothy, orchardgrass, bromegrass, red clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are ragweed, bluegrass, smartweed, bromegrass, wild carrot, and dandelion.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, maple, elm, walnut, beech, ash, and hickory. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are gooseberry, raspberry, blackberry, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, and slope. Examples of wetland plants are smartweed, wild millet, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite, quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include groundhog, woodcock, thrushes, woodpeckers, squirrels, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

Edge habitat refers to the junction where one major land use cover type ends and another begins. Although it is not rated in the table, it is of prime importance for both birds and animals ranging from the smallest songbird to Indiana's largest big game, the white-tailed deer. Most of the plants and animals that inhabit both openland and woodland are also in the edge habitat. Desirable edge habitats are consistently used by more wildlife than are the center of large fields of either woodland or cropland. A good example of edge habitat is the outside edge of a thick woodland that parallels the outside edge of a no-till field of corn.

engineering

Max L. Evans, soil conservation engineer, Soil Conservation Service, assisted in the preparation of this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding or ponding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 13 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, and soil reaction affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel and stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or stones, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, or organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table and permeability of the aquifer. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments more than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops

can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture and acidity.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*4*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sols*. An example is Alfisols.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *Alf*, from Alfisols).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalfs*, the suborder of the Alfisols that have an udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*3*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*4*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Aptakisic series

The Aptakisic series consists of deep, somewhat poorly drained, moderately permeable soils on outwash plains. These soils formed in silty outwash sediment deposited by slow moving or ponded water. Slope ranges from 0 to 2 percent.

Aptakisic soils are similar to Whitaker soils and are commonly near Martinsville, Patton, and Rensselaer soils in the landscape. Whitaker soils have more sand than Aptakisic soils and less silt in the subsoil. Martinsville soils have more sand and less silt in the subsoil and are on higher lying positions. Patton soils and Rensselaer soils have a thicker, darker surface layer and are on lower lying positions.

Typical pedon of Aptakisic silt loam, 0 to 2 percent slopes, in a cultivated field; in Reserve No. 53, 4,520 feet east and 2,080 feet north of the southwest corner sec. 34, T. 29 N., R. 10 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; moderate medium subangular blocky structure; friable; few fine roots; medium acid; abrupt smooth boundary.

B21t—9 to 17 inches; brown (10YR 5/3) silty clay loam; many fine distinct yellowish brown (10YR 5/6) and few fine distinct dark gray (10YR 4/1) mottles; moderate fine subangular blocky structure; firm; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; slightly acid; clear smooth boundary.

B22t—17 to 28 inches; yellowish brown (10YR 5/4) silty clay loam; many medium and coarse distinct grayish brown (2.5YR 5/2) and reddish yellow (7.5YR 6/8) mottles; moderate medium angular blocky structure; firm; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; neutral; clear wavy boundary.

B3t—28 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; many coarse distinct strong brown (7.5YR 5/8) and medium distinct grayish brown (2.5Y 5/2) mottles; moderate medium angular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; slight effervescence; neutral; clear wavy boundary.

C1—34 to 46 inches; brown (10YR 5/3) silt loam and thin strata of loam; many coarse distinct grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/8) mottles; massive; friable; strong effervescence; mildly alkaline; clear wavy boundary.

C2—46 to 60 inches; brown (10YR 5/3) silt loam; many coarse distinct grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/8) mottles; massive; friable; strong effervescence; moderately alkaline.

The thickness of the solum is 30 to 45 inches. The depth to carbonates is 28 to 40 inches.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2. It is dominantly silt loam but ranges to silty clay loam. The B2t horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 2 to 4 and is distinctly mottled. It is slightly acid or neutral in the upper part and neutral or mildly alkaline in the lower part. The C horizon is silt loam, loam, or sandy loam.

Blount series

The Blount series consists of deep, somewhat poorly drained, slowly permeable soils on till plains. These soils formed in calcareous glacial till. Slope ranges from 1 to 4 percent.

Blount soils are similar to Haskins Variant soils and are commonly near Glynwood, Morley, Pewamo, and Rawson Variant soils in the landscape. Haskins Variant soils have less clay in the upper part of the solum than Blount soils. Glynwood soils do not have dominant gray colors in the upper part of the subsoil and are on slightly higher lying positions. Morley soils have a brown subsoil that is free of gray mottles and are on higher lying positions. Pewamo soils have a thicker, darker surface layer and are on lower lying positions. Rawson Variant soils have less clay in the upper part of the solum and are on higher lying positions.

Typical pedon of Blount silt loam, 1 to 4 percent slopes, eroded, in a cultivated field; 97 feet west and 1,480 feet north of the southeast corner sec. 11, T. 28 N., R. 8 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak coarse granular structure; about 10 percent incorporated brown (10YR 5/3) silty clay loam material from the B horizon; friable; few fine roots; slightly acid; abrupt smooth boundary.

B21t—8 to 18 inches; brown (10YR 5/3) silty clay loam; few fine distinct gray (10YR 5/1) and few fine faint yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) and very dark gray (10YR 3/1) clay films on faces of peds; few fine roots; slightly acid; clear wavy boundary.

B22t—18 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct gray (10YR 5/1) and common fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; 2 percent gravel; neutral; clear smooth boundary.

C1—24 to 30 inches; brown (10YR 5/3) silty clay loam; few medium distinct gray (10YR 6/1) and common fine distinct brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; 2 percent gravel; slight effervescence; moderately alkaline; clear smooth boundary.

C2—30 to 60 inches; brown (10YR 5/3) clay loam; few fine distinct gray (10YR 6/1) and common fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; 2 percent gravel; strong effervescence; moderately alkaline.

The thickness of the solum is 20 to 45 inches. The depth to carbonates is 20 to 35 inches.

The Ap horizon is dark gray (10YR 4/1) or dark grayish brown (10YR 4/2). It is dominantly silt loam but ranges to loam. An A2 horizon is in some pedons. It has hue of 10YR, value of 5, and chroma of 2 or 3. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4 and is distinctly mottled. It is silty clay loam, clay loam, or silty clay. This horizon is medium acid or slightly acid in the upper part and neutral or mildly alkaline in the lower part. The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4.

Chelsea series

The Chelsea series consists of deep, excessively drained, rapidly permeable soils on ridges and side slopes near stream valleys. These soils formed in eolian sand and in sand from outwash. Slope ranges from 3 to 12 percent.

Chelsea soils are commonly near Martinsville, Morley, Patton, and Rensselaer soils in the landscape. Martinsville soils have less sand throughout than Chelsea soils and are on lower lying positions. Morley soils have more clay and are on lower lying positions. Patton and Rensselaer soils have a thicker, darker surface layer and are on lower lying positions.

Typical pedon of Chelsea loamy sand, 3 to 12 percent slopes, in a cultivated field; 660 feet north and 2,540 feet west of the southeast corner sec. 2, T. 29 N., R. 10 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) loamy sand, pale brown (10YR 6/3) dry; weak medium granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.

A21—7 to 15 inches; dark yellowish brown (10YR 4/4) loamy sand; weak fine subangular blocky structure; very friable; few fine roots; slightly acid; clear wavy boundary.

A22—15 to 26 inches; dark yellowish brown (10YR 4/4) loamy sand; weak fine subangular blocky structure; very friable; few fine roots; neutral; abrupt wavy boundary.

A&B—26 to 54 inches; dark yellowish brown (10YR 4/6) loamy sand (A2); single grain; loose; bands of brown (7.5YR 4/4) sandy loam (B2t); weak fine subangular blocky structure; friable; wavy discontinuous 1/8 inch to 1/4 inch bands in the upper part and a 4 inch band in the lower part; neutral; abrupt wavy boundary.

C—54 to 60 inches; brown (10YR 5/3) sand; single grain; loose; 10 percent gravel; slight effervescence; moderately alkaline.

The thickness of the solum is 50 to 70 inches. Carbonates are at a depth of 50 to 70 inches or more.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. The B2t bands have hue of 7.5YR or 10YR and value and chroma of 3 or 4. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6.

Eel series

The Eel series consists of deep, moderately well drained, moderately permeable soils on flood plains. These soils formed in stratified alluvial sediment. Slope ranges from 0 to 2 percent.

Eel soils are commonly near Genesee, Shoals, and Sloan soils in the landscape. Genesee soils have a browner subsoil than Eel soils that is free of gray mottles. Genesee soils are on higher lying positions. Shoals soils have gray horizons in the subsoil and are on slightly lower lying positions. Sloan soils have a thicker, darker surface layer and are on lower lying positions.

Typical pedon of Eel silt loam, occasionally flooded, in a cultivated field; 2,280 feet east and 68 feet north of the southwest corner sec. 7, T. 27 N., R. 9 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

C1—7 to 13 inches; brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; few fine roots; thin discontinuous very dark grayish brown (10YR 3/2) coating on faces of peds; neutral; clear smooth boundary.

C2—13 to 18 inches; brown (10YR 4/3) loam and thin strata of sandy loam; massive; friable; few fine roots; neutral; clear smooth boundary.

C3—18 to 24 inches; brown (10YR 4/3) loam and thin strata of sandy loam; common fine faint dark grayish brown (10YR 4/2) and common fine distinct dark yellowish brown (10YR 4/6) mottles; massive; friable; neutral; clear wavy boundary.

C4—24 to 34 inches; dark grayish brown (10YR 4/2) loam and thin strata of sandy loam; many medium distinct yellowish red (5YR 5/6), common medium distinct reddish brown (5YR 4/4), and common medium distinct strong brown (7.5YR 5/6) mottles; massive; friable; neutral; clear wavy boundary.

C5—34 to 43 inches; dark grayish brown (10YR 4/2) silty clay loam and thin strata of sandy loam; common fine distinct dark yellowish brown (10YR 4/6) mottles; massive; firm; slight effervescence; mildly alkaline; abrupt wavy boundary.

C6—43 to 51 inches; dark grayish brown (10YR 4/2) loam and thin strata of sandy loam; common coarse distinct yellowish brown (10YR 5/6) and few coarse distinct dark yellowish brown (10YR 4/6) mottles; massive; friable; strong effervescence; moderately alkaline; clear wavy boundary.

C7—51 to 60 inches; brown (10YR 4/3) clay loam and thin strata of sandy loam; many medium distinct dark gray (10YR 4/1), common medium distinct dark yellowish brown (10YR 4/6), and common medium distinct strong brown (7.5YR 5/8) mottles; massive; firm; strong effervescence; moderately alkaline.

The depth to carbonates is 24 to 40 inches.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is dominantly silt loam but ranges to loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is distinctly mottled. The texture of the C horizon is variable within short horizontal distances. It becomes coarser as depth increases.

Fox series

The Fox series consists of well drained soils that are moderately deep over sand and gravel. These soils formed in stratified loamy outwash sediment on terraces and outwash plains. Permeability is moderate in the solum and rapid in the underlying material. Slope ranges from 0 to 12 percent.

Fox soils are similar to Martinsville and Ockley soils and are commonly near Rensselaer and Whitaker soils in the landscape. Martinsville soils are not underlain with calcareous sand and gravel, and Ockley soils are deeper to calcareous sand and gravel than Fox soils. Rensselaer soils have a thicker, darker surface layer and are on lower lying positions. Whitaker soils are not underlain with calcareous sand and gravel and are on lower lying positions.

Typical pedon of Fox loam, 2 to 6 percent slopes, in a cultivated field; 1,660 feet east and 1,910 feet north of the southwest corner sec. 33, T. 27 N., R. 9 E.

Ap—0 to 8 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

B21t—8 to 15 inches; brown (7.5YR 4/4) gravelly clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark brown (7.5YR 3/2) clay films on faces of peds; 28 percent gravel; medium acid; clear wavy boundary.

B22t—15 to 21 inches; dark yellowish brown (10YR 3/4) gravelly clay loam; few fine distinct reddish brown (5YR 4/4) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark reddish brown (5YR 3/4) clay films on faces of peds and around pebbles; 19 percent gravel; medium acid; clear wavy boundary.

B23t—21 to 30 inches; dark yellowish brown (10YR 3/4) gravelly sandy clay loam; weak coarse subangular blocky structure; friable; thin discontinuous dark reddish brown (5YR 3/4) clay films in pores and around pebbles; 20 percent gravel; neutral; clear irregular boundary.

IIC—30 to 60 inches; yellowish brown (10YR 5/4) very gravelly coarse sand; single grain; loose; 58 percent gravel; violent effervescence; mildly alkaline.

The thickness of the solum is 24 to 40 inches. It coincides with the depth to calcareous gravelly coarse sand.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is dominantly loam but ranges to silt loam or sandy loam. The B2t horizon has hue of 10YR or 7.5YR and value and chroma of 3 or 4. It is clay loam, sandy clay loam, or gravelly analogs of these textures. Coarse fragment content ranges from 2 to 28 percent. The IIC horizon has coarse fragment content ranging from 10 to 60 percent.

Genesee series

The Genesee series consists of deep, well drained, moderately permeable soils on flood plains. These soils formed in stratified alluvial sediment. Slope ranges from 0 to 2 percent.

Genesee soils are commonly near Eel, Shoals, and Sloan soils in the landscape. Eel soils have gray mottles in the upper part of the subsoil and are on slightly lower lying positions than Genesee soils. Shoals soils have gray horizons in the subsoil and are on lower lying positions. Sloan soils have a thicker, darker surface layer and are on lower lying positions.

Typical pedon of Genesee silt loam, occasionally flooded, in a cultivated field; in Reserve of 10 Sections, 1,860 feet north and 2,505 feet west of the southeast corner sec. 18, T. 28 N., R. 9 E.

Ap—0 to 9 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

A12—9 to 18 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine subangular blocky structure; friable; few fine roots; thin discontinuous dark brown (10YR 3/3) organic coatings; neutral; clear wavy boundary.

C1—18 to 25 inches; brown (10YR 4/3) silt loam; 1/4 inch strata of sandy loam; massive; friable; neutral; clear wavy boundary.

C2—25 to 40 inches; brown (10YR 4/3) silt loam; 1/4 inch to 1/2 inch strata of sandy loam; few medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; slight effervescence; mildly alkaline; clear wavy boundary.

C3—40 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; 1/4 inch to 1/2 inch strata of sandy loam; few medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; slight effervescence; mildly alkaline.

The depth to carbonates is 20 to 35 inches.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is dominantly silt loam but ranges to loam. The C horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. It is loam, silt loam, or sandy loam, and texture is variable within short horizontal distances. Some pedons are sand or loamy sand below a depth of 50 inches.

Glynwood series

The Glynwood series consists of deep, moderately well drained, slowly permeable soils on till plains and moraines. These soils formed in calcareous glacial till. Slope ranges from 3 to 7 percent.

Glynwood soils are commonly near Blount, Hennepin, Morley, Pewamo, and Rawson Variant soils in the landscape. Blount soils have gray horizons in the subsoil and are on slightly lower lying positions than Glynwood soils. Hennepin and Morley soils have a brown subsoil that is free of gray mottles and are on higher lying positions. Pewamo soils have a thicker, darker surface layer and are on lower lying positions. Rawson Variant soils have less clay in the upper part of the solum and are on higher lying positions.

Typical pedon of Glynwood silt loam, 3 to 7 percent slopes, eroded, in a cultivated field; 1,130 feet east and 750 feet north of the southwest corner sec. 30, T. 28 N., R. 9 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

B21t—7 to 12 inches; dark yellowish brown (10YR 4/4) clay loam; few fine distinct dark grayish brown (10YR 4/2) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin patchy brown (10YR 4/3) clay films on faces of peds; neutral; clear smooth boundary.

B22t—12 to 23 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct grayish brown (10YR 5/2) and few medium distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; thin discontinuous brown (10YR 4/3) clay films on faces of peds; 2 percent gravel; neutral; gradual smooth boundary.

B3t—23 to 30 inches; brown (10YR 5/3) clay loam; common medium distinct yellowish brown (10YR 5/8) and few medium faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; 2 percent gravel; slight effervescence; mildly alkaline; gradual smooth boundary.

C—30 to 60 inches; yellowish brown (10YR 5/4) clay loam; few medium distinct grayish brown (10YR 5/2) mottles; massive; firm; 4 percent gravel; strong effervescence; moderately alkaline.

The thickness of the solum is 24 to 38 inches. The depth to carbonates is 20 to 38 inches.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is dominantly silt loam but ranges to loam. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6 and is distinctly mottled. The B2t horizon is clay loam, clay, silty clay, or silty clay loam. It is medium acid to neutral in the upper part and neutral or mildly alkaline in the lower part. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam or silty clay loam.

Haskins Variant

The Haskins Variant consists of deep, somewhat poorly drained soils on till plains. These soils are moderately permeable in the upper part of the solum and slowly permeable in the lower part of the solum and underlying material. They formed in stratified loamy sediment and the underlying calcareous glacial till. Slope ranges from 1 to 4 percent.

Haskins Variant soils are similar to Blount soils and are commonly near Pewamo and Rawson Variant soils in the landscape. Blount soils have more clay in the upper part of the solum than Haskins Variant soils. Pewamo soils have a thicker, darker surface layer and are on lower lying positions. Rawson Variant soils have a brown subsoil that is free of gray mottles and are on higher lying positions.

Typical pedon of Haskins Variant fine sandy loam, 1 to 4 percent slopes, in a cultivated field; 1,800 feet south and 145 feet east of the northwest corner sec. 21, T. 29 N., R. 10 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

B1—10 to 18 inches; brown (10YR 5/3) sandy loam; few fine distinct gray (10YR 5/1) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous brown (7.5YR 4/4) coatings on faces of peds; few black (N 2/0) iron and manganese oxide accumulations; slightly acid; clear wavy boundary.

B21t—18 to 24 inches; yellowish brown (10YR 5/4) loam; common medium distinct yellowish brown (10YR 5/6) and common fine distinct gray (10YR 5/1) mottles; moderate fine subangular blocky structure; friable; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; few black (N 2/0) iron and manganese oxide accumulations; slightly acid; clear wavy boundary.

B22t—24 to 31 inches; brown (10YR 5/3) loam; many medium distinct yellowish brown (10YR 5/6) and common medium distinct gray (10YR 5/1) and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; friable; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; few black (N 2/0) and manganese oxide accumulations; slightly acid; clear wavy boundary.

IIB3t—31 to 37 inches; brown (10YR 5/3) silty clay loam; common medium distinct grayish brown (2.5Y 5/2) and many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; few black (N 2/0) iron and manganese oxide accumulations; 3 percent gravel; neutral; gradual wavy boundary.

IIC—37 to 60 inches; yellowish brown (10YR 5/4) clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; 9 percent gravel; violent effervescence; mildly alkaline.

The thickness of the solum is 26 to 48 inches. The depth to free carbonates is 20 to 40 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It is dominantly fine sandy loam but ranges to loam, sandy loam, or silt loam. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4 and is distinctly mottled. It is loam, sandy loam, sandy clay loam, or clay loam. The IIB2t horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4 and is distinctly mottled. It is clay loam, silty clay loam, silty clay, or clay. The IIC horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is clay loam or silty clay loam.

Hennepin series

The Hennepin series consists of deep, well drained soils on narrow side slopes along drainageways. These soils formed in calcareous glacial till. Permeability is moderately slow. Slope ranges from 30 to 70 percent.

Hennepin soils are commonly near Glynwood and Morley soils in the landscape. Glynwood soils have gray mottles in the upper part of the subsoil and are on lower lying positions than Hennepin soils. Morley soils have more clay throughout and are on the less sloping areas along drainageways.

Typical pedon of Hennepin loam, 30 to 70 percent slopes, in a wooded area; 1,240 feet west and 1,200 feet south of the northeast corner sec. 14, T. 28 N., R. 8 E.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; common fine roots; 5 percent gravel; neutral; clear smooth boundary.

B2—5 to 14 inches; yellowish brown (10YR 5/4) loam; weak fine subangular blocky structure; friable; common fine roots; thin discontinuous dark grayish brown (10YR 4/2) organic coatings; 5 percent gravel; slight effervescence; mildly alkaline; gradual smooth boundary.

C—14 to 60 inches; brown (10YR 5/3) loam; massive; firm; few fine roots in the upper part; 5 percent gravel; strong effervescence; moderately alkaline.

The thickness of the solum is 5 to 20 inches. The depth to carbonates is 5 to 18 inches. Reaction throughout the solum is neutral to moderately alkaline.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. It is dominantly loam but ranges to silt loam. The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam, silt loam, or clay loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam or clay loam.

Houghton series

The Houghton series consists of deep, very poorly drained soils in depressions on moraines, till plains, or outwash plains. These soils formed in herbaceous organic deposits. Permeability is moderately slow to moderately rapid. Slope ranges from 0 to 2 percent.

Houghton soils are commonly near Patton and Pewamo soils in the landscape. Patton and Pewamo soils consist of mineral materials and are on slightly higher positions than Houghton soils.

Typical pedon of Houghton muck, drained, in a cultivated field; 75 feet west and 2,150 feet south of the northeast corner sec. 29, T. 26 N., R. 9 E.

Oap—0 to 10 inches; black (N2/0) broken face and rubbed sapric material; 4 percent fiber, 2 percent fiber rubbed; weak coarse subangular blocky structure; friable; many fine and medium roots; slightly acid; abrupt smooth boundary.

Oa2—10 to 22 inches; black (N2/0) broken face and rubbed sapric material; 12 percent fiber, 3 percent fiber rubbed; weak coarse subangular blocky structure; friable; many fine and medium roots; slightly acid; gradual wavy boundary.

Oa3—22 to 37 inches; black (5YR 2/1) broken face sapric material, black (N2/0) rubbed; 25 percent fiber, 7 percent fiber rubbed; massive; friable; common fine roots; slightly acid; clear wavy boundary.

Oa4—37 to 47 inches; black (10YR 2/1) broken face sapric material, black (N2/0) rubbed; 30 percent fiber, 12 percent fiber rubbed; massive; friable; few fine roots; slightly acid; clear wavy boundary.

Oe5—47 to 60 inches; dark reddish brown (5YR 2/2) broken face hemic material, very dark brown (10YR 2/2) rubbed; 75 percent fiber, 35 percent fiber rubbed; massive; friable; slightly acid.

The organic deposit ranges from 51 inches to many feet in thickness. It is slightly acid or neutral.

The Oap horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1, or it is neutral and has value of 2 or 3. The lower horizons have hue of 5YR, 7.5YR, or 10YR, value of 2 or 3, and chroma of 1 to 3 or are neutral and have value of 2 or 3. Some pedons have a thin layer of hemic material in the lower part.

Martinsville series

The Martinsville series consists of deep, well drained, moderately permeable soils on terraces and outwash plains. These soils formed in stratified loamy outwash sediment. Slope ranges from 0 to 8 percent.

These soils have a lower base saturation than is definitive for the Martinsville series. However, this difference does not alter the usefulness or behavior of these soils.

Martinsville soils are similar to Fox and Ockley soils and are commonly near Aptakisic, Rensselaer, and Whitaker soils in the landscape. Fox and Ockley soils are underlain with calcareous sand and gravel. Aptakisic soils have more silt and less sand in the subsoil than Martinsville soils and are on lower lying positions. Rensselaer soils have a thicker, darker surface layer and are on lower lying positions. Whitaker soils have gray horizons in the subsoil and are on lower lying positions.

Typical pedon of Martinsville silt loam, 2 to 8 percent slopes, in a cultivated field; 2,280 feet east and 420 feet north of the southwest corner sec. 34, T. 27 N., R. 9 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; strongly acid; abrupt smooth boundary.

B21t—8 to 17 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine subangular blocky structure; friable; few fine roots; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

B22t—17 to 31 inches; brown (7.5YR 4/4) loam; common fine distinct yellowish brown (10YR 5/8) and few fine faint yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous dark reddish brown (5YR 3/4) clay films on faces of peds and in pores; strongly acid; clear wavy boundary.

IIB23t—31 to 39 inches; brown (7.5YR 4/4) sandy clay loam; few fine distinct yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; friable; thin discontinuous dark reddish brown (5YR 3/4) clay films on faces of peds; strongly acid; clear wavy boundary.

IIB3t—39 to 47 inches; brown (7.5YR 4/4) sandy loam; weak coarse subangular blocky structure; friable; thin discontinuous dark reddish brown (5YR 3/4) clay films on faces of peds; 2 percent gravel; strongly acid; clear wavy boundary.

IIC—47 to 60 inches; dark yellowish brown (10YR 4/4) sandy loam; thin strata of loamy sand; massive; very friable; 9 percent gravel; strongly acid.

The thickness of the solum is 40 to 60 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is dominantly silt loam but ranges to loam or sandy loam. The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is clay loam, loam, silt loam, sandy loam, or sandy clay loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is sandy loam, loam, or silt loam and has thin strata of sand or loamy sand.

Millsdale series

The Millsdale series consists of moderately deep, very poorly drained soils in upland depressions. These soils formed in glacial material and in residuum derived from the underlying dolomite and limestone bedrock. Permeability is moderately slow. Slope ranges from 0 to 2 percent.

Millsdale soils are commonly near Milton and Randolph soils in the landscape. Milton soils have a brown subsoil that is free of gray mottles and are on higher lying positions than Millsdale soils. Randolph soils have a thinner, lighter colored surface layer and are on slightly higher lying positions.

Typical pedon of Millsdale silty clay loam, in a cultivated field; 480 feet north and 1,840 feet east of the southwest corner sec. 21, T. 28 N., R. 8 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure; friable; few fine roots; neutral; abrupt smooth boundary.

A12—9 to 14 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; few fine distinct olive (5Y 5/3) and strong brown (7.5YR 5/6) mottles; moderate medium angular blocky structure; firm; few fine roots; neutral; clear wavy boundary.

B2tg—14 to 21 inches; dark gray (5Y 4/1) silty clay; many medium distinct light olive brown (2.5Y 5/6), yellowish brown (10YR 5/8), and brownish yellow (10YR 6/6) mottles; moderate fine angular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; 1 percent coarse fragments; slight effervescence; mildly alkaline; abrupt wavy boundary.

IICg—21 to 25 inches; gray (5Y 5/1) channery silty clay loam; many medium distinct light olive brown (2.5Y 5/6) and yellowish brown (10YR 5/6) mottles; strong thick platy structure; firm; 35 percent coarse fragments; slight effervescence; moderately alkaline; abrupt wavy boundary.

IIR—25 inches; very pale brown (10YR 7/3) hard dolomite bedrock.

The thickness of the solum is 20 to 40 inches. It coincides with the depth to hard dolomite or limestone bedrock.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly silty clay loam but ranges to silt loam or clay loam and is 10 to 18 inches thick. The B2tg horizon has hue of 5Y, value of 4 to 6, and chroma of 1 or 2 and is distinctly mottled. It is silty clay, silty clay loam, clay loam, or channery analogs of these textures.

Milton series

The Milton series consists of moderately deep, well drained soils on uplands. These soils formed in glacial material and in residuum derived from the underlying dolomite and limestone bedrock. Permeability is moderately slow. Slope ranges from 0 to 15 percent.

Milton soils are commonly near Millsdale and Randolph soils in the landscape. Millsdale soils have a thicker, darker surface layer than Milton soils and are on lower lying positions. Randolph soils have gray horizons in the subsoil and are on lower lying positions.

Typical pedon of Milton silt loam, 2 to 6 percent slopes, in a cultivated field; 2,120 feet north and 2,365 feet east of the southwest corner sec. 20, T. 28 N., R. 9 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; few fine roots; 3 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21t—7 to 13 inches; dark yellowish brown (10YR 4/4) clay loam; moderate fine subangular blocky structure; firm; thin discontinuous brown (10YR 4/3) clay films on faces of peds; few discontinuous dark brown (10YR 3/3) organic coatings in root channels; 14 percent coarse fragments; neutral; clear smooth boundary.

IIB22t—13 to 24 inches; dark yellowish brown (10YR 4/4) channery clay loam; moderate medium subangular blocky structure; firm; thin discontinuous brown (10YR 4/3) clay films on faces of peds; few discontinuous dark brown (10YR 3/3) organic coatings in root channels; 20 percent coarse fragments; neutral; abrupt wavy boundary.

IIR—24 inches; very pale brown (10YR 7/3) hard dolomite bedrock.

The thickness of the solum is 20 to 40 inches. It coincides with the depth to hard dolomite or limestone bedrock.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is dominantly silt loam but ranges to loam. The B2t and IIB2t horizons have hue of 10YR, value of 4 or 5, and chroma of 3 or 4. They are silty clay loam, clay loam, or channery analogs of these textures.

Morley series

The Morley series consists of deep, well drained, slowly permeable soils on till plains and moraines. These soils formed in calcareous glacial till. Slope ranges from 6 to 30 percent.

Morley soils are commonly near Blount, Chelsea, Glynwood, Hennepin, and Rawson Variant soils in the landscape. Blount soils have gray horizons in the subsoil and are on lower lying positions than Morley soils. Chelsea soils have more sand throughout and are on higher lying positions. Glynwood soils have gray mottles in the upper part of the subsoil and are on lower lying positions. Hennepin soils have less clay throughout and are on steep and very steep side slopes. Rawson Variant soils have less clay in the upper part of the solum and are on higher lying positions.

Typical pedon of Morley silt loam, 6 to 12 percent slopes, eroded, in a pasture; 600 feet west and 1,850 feet north of the southeast corner sec. 10, T. 28 N., R. 8 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

B21t—7 to 13 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; few fine roots; thin discontinuous pale brown (10YR 6/3) silt coatings and thin discontinuous brown (10YR 4/3) clay films on faces of peds; medium acid; clear wavy boundary.

B22t—13 to 19 inches; brown (10YR 5/3) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; thin discontinuous pale brown (10YR 6/3) silt coatings and thin continuous brown (10YR 4/3) clay films on faces of peds; medium acid; clear wavy boundary.

B23t—19 to 22 inches; brown (10YR 4/3) clay; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few pebbles; neutral; clear wavy boundary.

B3t—22 to 28 inches; brown (10YR 5/3) clay loam; few medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; thin discontinuous brown (10YR 4/3) clay films in pores and around pebbles; few pebbles; slight effervescence; mildly alkaline; clear wavy boundary.

C—28 to 60 inches; brown (10YR 5/3) clay loam; few medium distinct yellowish brown (10YR 5/8) mottles; massive; firm; few pebbles; strong effervescence; mildly alkaline.

The thickness of the solum is 20 to 45 inches. The depth to free carbonates is 20 to 40 inches.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is dominantly silt loam but ranges to loam. In wooded areas, an A1 horizon is present. It is 1 inch to 3 inches thick. An A2 horizon, where present, has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is clay, clay loam, silty clay loam, silt loam, or silty clay. The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is clay loam or silty clay loam.

Ockley series

The Ockley series consists of deep, well drained, moderately permeable soils on terraces and outwash plains. These soils formed in stratified loamy outwash sediment. Slope ranges from 0 to 6 percent.

These soils have less clay in the upper part of the subsoil and do not have the clay increase in the subsoil that is definitive for the Ockley series. These differences, however, do not alter the usefulness or behavior of these soils.

Ockley soils are similar to Fox and Martinsville soils and are commonly near Rensselaer and Whitaker soils in the landscape. Fox soils are shallower to calcareous sand and gravel than Ockley soils. Martinsville soils are not underlain with calcareous sand and gravel. Rensselaer soils have a thicker, darker surface layer and are on lower lying positions. Whitaker soils are not underlain with sand and gravel and are on lower lying positions.

Typical pedon of Ockley loam, 0 to 2 percent slopes, in a cultivated field; 700 feet east and 1,390 feet north of the southwest corner sec. 33, T. 27 N., R. 9 E.

Ap—0 to 8 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

B21t—8 to 17 inches; dark yellowish brown (10YR 4/4) fine sandy loam; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; medium acid; clear wavy boundary.

B22t—17 to 27 inches; brown (10YR 4/3) sandy loam; moderate medium subangular blocky structure; friable; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; medium acid; clear smooth boundary.

B23t—27 to 40 inches; brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; friable; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds and in root channels; 1 percent gravel; medium acid; clear smooth boundary.

B24t—40 to 47 inches; dark brown (7.5YR 3/2) gravelly sandy clay loam; weak medium subangular blocky structure; friable; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; 16 percent gravel; slightly acid; gradual wavy boundary.

B3t—47 to 55 inches; dark brown (7.5YR 3/2) gravelly sandy clay loam; weak medium subangular blocky structure; friable; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds and around pebbles; 35 percent gravel; neutral; clear irregular boundary.

IIC—55 to 60 inches; light gray (10YR 7/2) gravelly coarse sand; single grain; loose; 24 percent gravel; strong effervescence; mildly alkaline.

The thickness of the solum is 40 to 60 inches. It coincides with the depth to calcareous gravelly coarse sand.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is dominantly loam but ranges to silt loam. The upper part of the B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The lower part of the B2t horizon has hue of 10YR or 7.5YR, value of 3, and chroma of 2 or 3. The B2t horizon is fine sandy loam, loam, clay loam, sandy loam, sandy clay loam, or gravelly analogs of these textures.

Patton series

The Patton series consists of deep, poorly drained soils on lake plains. These soils formed in stratified lacustrine sediment. Permeability is moderately slow. Slope ranges from 0 to 2 percent.

Patton soils are similar to Pewamo and Rensselaer soils and are commonly near the Aptakisic, Chelsea, and Houghton soils in the landscape. Pewamo soils have less silt throughout than Patton soils, and Rensselaer soils have more sand throughout. Aptakisic soils do not have dominantly gray horizons in the upper part of the subsoil and are on slightly higher positions. Chelsea soils have more sand throughout and are on higher lying positions. Houghton soils are organic throughout and are in depressions.

Typical pedon of Patton silty clay loam, in a cultivated field; in Reserve No. 52, 3,820 feet west and 540 feet north of the southeast corner sec. 26, T. 29 N., R. 10 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (2.5Y 5/2) dry; moderate fine subangular blocky structure; friable; few fine roots; neutral; abrupt smooth boundary.

B21g—8 to 21 inches; dark gray (10YR 4/1) silty clay loam; few fine distinct dark brown (10YR 3/3) and common fine distinct dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure parting to weak fine subangular blocky; firm; few fine roots; slightly acid; clear smooth boundary.

B22g—21 to 33 inches; gray (10YR 5/1) silty clay loam; many coarse distinct yellowish brown (10YR 5/6) and common medium distinct dark yellowish brown (10YR 4/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous dark gray (10YR 4/1) coatings on faces of peds; neutral; gradual smooth boundary.

B23g—33 to 40 inches; gray (10YR 6/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and few medium distinct strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous gray (10YR 5/1) coating on faces of peds; neutral; clear smooth boundary.

B3g—40 to 44 inches; gray (10YR 6/1) silty clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; firm; neutral; clear smooth boundary.

Cg—44 to 60 inches; gray (10YR 5/1) silty clay loam; strata of loam and clay loam; common medium distinct yellowish brown (10YR 5/6) and brown (10YR 5/3) mottles and common fine faint dark gray (10YR 4/1) mottles; massive; friable; slight effervescence; mildly alkaline.

The thickness of the solum is 34 to 47 inches. It coincides with the depth to carbonates.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly silty clay loam but ranges to silt loam. The B2g horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2 and is distinctly mottled. It is silty clay loam or silt loam. The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 or 2. It is silt loam, loam, clay loam, or silty clay loam.

A sandy substratum phase of Patton soils is also recognized as map unit Pe in Huntington County.

Pewamo series

The Pewamo series consists of deep, very poorly drained soils on till plains and moraines. These soils formed in calcareous glacial till. Permeability is moderately slow. Slope ranges from 0 to 2 percent.

These soils do not have the clay increase in the subsoil that is definitive for the Pewamo series. However, this difference does not alter the usefulness or behavior of these soils.

Pewamo soils are similar to Patton and Rensselaer soils and are commonly near Blount, Glynwood, and Haskins Variant soils in the landscape. Patton soils have more silt throughout than Pewamo soils, and Rensselaer soils have more sand throughout. Blount soils do not have dominantly gray horizons in the upper part of the subsoil and are on slightly higher lying positions. Glynwood soils have gray mottles in the upper part of the subsoil and are on higher lying positions. Haskins Variant soils have less clay in the upper part of the solum and are on higher lying positions.

Typical pedon of Pewamo silty clay loam, in a cultivated field; 1,800 feet west and 88 feet north of the southeast corner sec. 16, T. 28 N., R. 10 E.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

A12—8 to 12 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure; firm; few fine roots; slightly acid; clear smooth boundary.

B21tg—12 to 20 inches; dark gray (10YR 4/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and light brownish gray (2.5Y 6/2) and common fine faint gray (10YR 5/1) mottles; moderate medium angular blocky structure; firm; few fine roots; thin continuous very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; few pebbles; neutral; gradual smooth boundary.

B22tg—20 to 30 inches; gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6), light olive brown (2.5Y 5/6), and light brownish gray (2.5Y 5/2) mottles; moderate medium angular blocky structure; firm; thin continuous dark gray (10YR 4/1) clay films on faces of peds and in pores; few pebbles; neutral; gradual smooth boundary.

B23tg—30 to 36 inches; gray (10YR 6/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and light olive brown (2.5Y 5/6) mottles; moderate medium subangular blocky structure; firm; thin continuous dark gray (10YR 4/1) clay films on faces of peds; few pebbles; slight effervescence; mildly alkaline; abrupt wavy boundary.

Cg—36 to 60 inches; gray (5Y 5/1) silty clay loam; common coarse distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/8) mottles; massive; firm; few pebbles; slight effervescence; mildly alkaline.

The thickness of the solum is 30 to 60 inches. The depth to carbonates is 30 to 50 inches. Coarse fragments range from 0 to 5 percent.

The Ap or A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B2tg horizon has hue of 2.5Y, 5Y, or 10YR, value of 4 or 6, and chroma of 1 or 2 and is mottled. It is silty clay loam, silty clay, clay, or clay loam. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam or clay loam.

Randolph series

The Randolph series consists of moderately deep, somewhat poorly drained soils on uplands. These soils formed in glacial material and in residuum derived from the underlying dolomite and limestone bedrock. Permeability is moderately slow. Slope ranges from 0 to 2 percent.

Randolph soils are commonly near Millsdale and Milton soils in the landscape. Millsdale soils have a thicker, darker surface layer than Randolph soils and are on lower lying positions. Milton soils have brown subsoils that are free of gray mottles and are on higher lying positions.

Typical pedon of Randolph loam, 0 to 2 percent slopes, in a cultivated field; 2,080 feet north and 920 feet east of the southwest corner sec. 22, T. 28 N., R. 8 E.

Ap—0 to 8 inches; brown (10YR 4/3) loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; few fine roots; medium acid; abrupt smooth boundary.

A2—8 to 15 inches; brown (10YR 4/3) loam; few fine distinct yellowish brown (10YR 5/6) and common medium distinct grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; few fine roots; 2 percent coarse fragments; slightly acid; clear wavy boundary.

IIB22tg—15 to 25 inches; grayish brown (10YR 5/2) clay loam; many fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; thin discontinuous brown (10YR 4/3) clay films on faces of peds; 2 percent coarse fragments; neutral; abrupt wavy boundary.

IIR—25 inches; very pale brown (10YR 7/3) hard dolomite bedrock.

The thickness of the solum is 20 to 40 inches. It coincides with the depth to hard dolomite or limestone bedrock. Reaction throughout the solum ranges from medium acid to neutral.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is dominantly loam but ranges to silt loam. The A2 horizon, where present, has hue of 10YR, value of 4 or 5, and chroma of 1 to 3. It is loam or silt loam. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4 and is distinctly mottled. It is silty clay loam, clay, or clay loam.

Rawson Variant

The Rawson Variant consists of deep, moderately well drained or well drained soils on till plains. These soils are moderately permeable in the upper part of the solum and slowly permeable in the lower part of the solum and the underlying material. They formed in stratified sediment and the underlying calcareous glacial till. Slope ranges from 2 to 12 percent.

Rawson Variant soils are commonly near Blount, Glynwood, Haskins Variant, and Morley soils in the landscape. The Blount, Glynwood, and Morley soils have more clay in the upper part of the solum than Rawson Variant soils and are on lower lying positions. Haskins Variant soils have gray horizons in the subsoil and are on lower lying positions.

Typical pedon of Rawson Variant fine sandy loam, 2 to 6 percent slopes, in a cultivated field; 250 feet west and 1,700 feet north of the southeast corner sec. 7, T. 29 N., R. 10 E.

Ap—0 to 10 inches; brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

B21t—10 to 16 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium subangular blocky structure; friable; common fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

B22t—16 to 23 inches; yellowish brown (10YR 5/4) sandy loam; few fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; strongly acid; clear smooth boundary.

B23t—23 to 29 inches; yellowish brown (10YR 5/4) sandy loam; few fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; strongly acid; clear smooth boundary.

B24t—29 to 35 inches; dark yellowish brown (10YR 4/4) fine sandy loam; common medium distinct grayish brown (10YR 5/2), yellowish brown (10YR 5/6), and brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable; thin patchy brown (10YR 4/3) clay films on faces of peds; 1 percent gravel; slightly acid; clear smooth boundary.

IIB3t—35 to 41 inches; dark yellowish brown (10YR 4/4) clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; 3 percent gravel; neutral; clear smooth boundary.

IIC—41 to 60 inches; yellowish brown (10YR 5/4) clay loam; massive; firm; 3 percent gravel; strong effervescence; mildly alkaline.

The thickness of the solum is 24 to 48 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is dominantly fine sandy loam but ranges to silt loam, loam, or sandy loam. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is loam, clay loam, fine sandy loam, sandy loam, or sandy clay loam. The IIBt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silty clay loam, clay loam, clay, or silty clay. The IIC horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is clay loam or silty clay loam.

Rensselaer series

The Rensselaer series consists of deep, very poorly drained, moderately permeable soils on low lying terraces and outwash plains. These soils formed in stratified loamy outwash sediment. Slope ranges from 0 to 2 percent.

Rensselaer soils are similar to Patton and Pewamo soils and are commonly near Fox, Martinsville, Ockley, and Whitaker soils. Patton and Pewamo soils have less sand throughout than Rensselaer soils. Fox and Ockley soils are underlain with calcareous sand and gravel and are on higher lying positions. Martinsville soils have a brown subsoil that is free of gray mottles and are on higher lying positions. Whitaker soils do not have dominantly gray horizons in the upper part of the subsoil and are on higher lying positions.

Typical pedon of Rensselaer loam, in a cultivated field; in Reserve No. 47, 2,150 feet west and 4,330 feet north of the southeast corner sec. 12, T. 29 N., R. 10 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; few fine roots; thin discontinuous very dark gray (10YR 3/1) coatings on faces of peds; slightly acid; abrupt smooth boundary.

A12—9 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure; friable; few fine roots; thin continuous very dark gray (10YR 3/1) coatings on faces of peds; slightly acid; clear wavy boundary.

B21tg—14 to 23 inches; dark gray (10YR 4/1) silt loam; common fine distinct dark yellowish brown (10YR 4/6) and few fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; thin discontinuous very dark grayish brown (10YR 3/2) coatings on faces of peds; slightly acid; clear smooth boundary.

B22tg—23 to 32 inches; dark gray (10YR 4/1) clay loam; common fine distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; neutral; clear smooth boundary.

B23tg—32 to 37 inches; grayish brown (10YR 5/2) clay loam; common medium distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; neutral; clear wavy boundary.

B3g—37 to 46 inches; gray (10YR 5/1) loam; common medium distinct yellowish brown (10YR 5/8), common fine distinct brownish yellow (10YR 6/6), and few fine distinct pale brown (10YR 6/3) mottles; weak fine subangular blocky structure; friable; thin discontinuous dark gray (10YR 4/1) coatings on faces of peds; neutral; clear wavy boundary.

Cg—46 to 60 inches; gray (10YR 6/1) loam; strata of sandy loam and fine sandy loam; common coarse distinct yellowish brown (10YR 5/8), common medium distinct brownish yellow (10YR 6/6), and few fine distinct dark gray (10YR 4/1) mottles; massive; friable; slight effervescence; moderately alkaline.

The thickness of the solum is 35 to 60 inches.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B2tg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2 and is distinctly mottled. It is silty clay loam, clay loam, loam, silt loam, or sandy clay loam. The Cg horizon is loam, clay loam, silt loam, fine sandy loam, or sandy loam. It has thin strata of fine sand.

Shoals series

The Shoals series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in stratified alluvial sediment. Slope ranges from 0 to 2 percent.

Shoals soils are commonly near Eel, Genesee, and Sloan soils in the landscape. Eel soils do not have dominantly gray colors in the upper part of the subsoil and are on slightly higher lying positions than Shoals soils. Genesee soils have a brown subsoil that is free of gray mottles and are on higher lying positions. Sloan soils have a thicker, darker surface layer and are on lower lying positions.

Typical pedon of Shoals silt loam, occasionally flooded, in a cultivated field; 2,100 feet west and 2,160 feet north of the southeast corner sec. 34, T. 29 N., R. 8 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

B2g—8 to 15 inches; dark grayish brown (10YR 4/2) silt loam; common fine distinct reddish brown (5YR 4/4) mottles; moderate medium subangular blocky structure; friable; few fine roots; patchy thin very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; clear wavy boundary.

C1g—15 to 23 inches; dark grayish brown (2.5Y 4/2) loam; common medium distinct dark gray (10YR 4/1) and common fine distinct yellowish brown (10YR 5/4) mottles; massive; friable; few fine roots; neutral; clear wavy boundary.

C2—23 to 31 inches; brown (10YR 5/3) loam; thin strata of sandy loam; common medium distinct dark gray (10YR 4/1) and yellowish brown (10YR 5/6) mottles; massive; friable; few fine roots; neutral; clear wavy boundary.

C3g—31 to 48 inches; dark gray (10YR 4/1) sandy loam; few fine distinct dark yellowish brown (10YR 4/6) and common medium distinct brownish yellow (10YR 6/6) mottles; massive; very friable; neutral; clear wavy boundary.

C4g—48 to 60 inches; dark gray (10YR 4/1) gravelly sandy loam; common medium distinct dark yellowish brown (10YR 4/6) mottles; massive; very friable; 16 percent gravel; neutral.

The depth to carbonates is 20 to 60 inches or more.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It is dominantly silt loam but ranges to loam. The B2g horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 3 and is distinctly mottled. It is silt loam, loam, or sandy loam. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 4 and is distinctly mottled. The texture of the C horizon is variable within short horizontal distances. It is silt loam, clay loam, silty clay loam, loam, or gravelly analogs of these textures. The C horizon generally becomes coarser as depth increases.

Sloan series

The Sloan series consists of deep, very poorly drained soils on flood plains. These soils formed in stratified alluvial sediment. Permeability is moderately slow. Slope ranges from 0 to 2 percent.

Sloan soils are commonly near Eel, Genesee, and Shoals soils in the landscape. Eel soils do not have dominantly gray colors in the upper part of the subsoil and are on higher lying positions than Sloan soils. Genesee soils have a brown subsoil that is free of gray mottles and are on higher lying positions. Shoals soils have a thinner, lighter colored surface layer and are on slightly higher lying positions.

Typical pedon of Sloan silt loam, frequently flooded, in an undrained area; 2,520 feet east and 3,020 feet south of the northwest corner sec. 32, T. 27 N., R. 9 E.

A11—0 to 8 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; common fine roots; thin discontinuous very dark gray (N 3/0) coatings on faces of peds; slightly acid; clear smooth boundary.

A12—8 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; common medium distinct brown (7.5YR 4/4) mottles; weak medium granular structure; friable; few fine roots; thin discontinuous very dark gray (N 3/0) coatings on faces of peds; neutral; clear smooth boundary.

B2g—14 to 34 inches; dark grayish brown (10YR 4/2) loam; few fine distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable; few fine roots; thin discontinuous very dark grayish brown (10YR 3/2) coatings on faces of peds; neutral; clear smooth boundary.

C1g—34 to 52 inches; dark grayish brown (10YR 4/2) silt loam; few fine faint dark gray (10YR 4/1) mottles; massive; friable; neutral; clear wavy boundary.

C2g—52 to 60 inches; dark grayish brown (10YR 4/2) loam; common fine distinct yellowish brown (10YR 5/6) and common fine faint dark gray (10YR 4/1) mottles; massive; friable; neutral.

The depth to carbonates is 20 to 60 inches or more.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly silt loam but ranges to loam or silty clay loam. The B2g horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2 and is distinctly mottled. It is silty clay loam, clay loam, loam, or silt loam. The Cg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2 and is mottled. It is silt loam, loam, silty clay loam, clay loam, sandy loam, or gravelly analogs of these textures. The C horizon in some pedons is stratified.

Whitaker series

The Whitaker series consists of deep, somewhat poorly drained, moderately permeable soils on terraces and outwash plains. These soils formed in stratified loamy outwash sediment. Slope ranges from 0 to 2 percent.

Whitaker soils are similar to Aptakisic soils and are commonly near Fox, Martinsville, Ockley, and Rensselaer soils in the landscape. Aptakisic soils have less sand and more silt in the solum than Whitaker soils. Fox and Ockley soils are underlain with calcareous sand and gravel and are on higher lying positions. Martinsville soils have a brown subsoil that is free of gray mottles and are on higher lying positions. Rensselaer soils have a thicker, darker surface layer and are on lower lying positions.

Typical pedon of Whitaker loam, in a cultivated field; in Reserve No. 48, 3,900 feet west and 2,480 feet north of the southeast corner sec. 12, T. 29 N., R. 10 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

B1—7 to 12 inches; yellowish brown (10YR 5/4) loam; many medium faint yellowish brown (10YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; friable; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

B21t—12 to 23 inches; brown (10YR 4/3) clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear wavy boundary.

B22t—23 to 37 inches; yellowish brown (10YR 5/4) clay loam; few fine distinct grayish brown (10YR 5/2) and common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

C1—37 to 50 inches; yellowish brown (10YR 5/4) loam; thin strata of clay loam; common coarse distinct light brownish gray (10YR 6/2) and common medium faint yellowish brown (10YR 5/6) mottles; massive; friable; neutral; clear wavy boundary.

C2—50 to 60 inches; pale brown (10YR 6/3) clay loam; thin strata of loam and sandy loam; common medium distinct yellowish brown (10YR 5/8) and common medium faint light brownish gray (10YR 6/2) mottles; massive; firm; slight effervescence; mildly alkaline.

The thickness of the solum is 36 to 60 inches. The depth to carbonates is 40 to 60 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is dominantly loam but ranges to silt loam. The B2t horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4 and is distinctly mottled. It is clay loam, loam, sandy clay loam, or silty clay loam. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is silt loam, loam, clay loam, fine sandy loam, or sandy loam and has thin strata of fine sand.

formation of the soils

In this section the major factors of soil formation and their degree of importance in the formation of the soils in the county are discussed.

factors of soil formation

Soil is produced by soil-forming processes acting on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil profile. It may be much or little, but some time is always required for differentiation of soil horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

parent material

Parent material is the unconsolidated mass from which a soil forms. It determines the limits of the chemical and mineralogical composition of the soil. The dominant parent materials in Huntington County are glacial till, outwash deposits, lacustrine deposits, alluvium, organic material, and dolomite or limestone residuum.

Glaciers covered the surface area for thousands of years. They retreated from it about 15,000 years ago. The materials from which the soils formed originally were deposited by glaciers or by melt water from glaciers. In time, however, some of the materials have been reworked and redeposited by subsequent actions of water and wind. Although the parent materials are of common glacial origin, their properties vary greatly, sometimes within small areas, depending on the nature of deposits.

Glacial till was laid down directly by glacial ice with a minimum of water action. It consists of mixed particles of different sizes. Some small pebbles in glacial till have sharp corners, indicating that they have not been worn by water washing. The glacial till in Huntington County is calcareous, firm silty clay loam or clay loam. The Blount soils formed in glacial till. These soils typically have a moderately fine textured subsoil that has well developed structure.

Outwash materials were deposited by running water from melting glaciers. The size of the particles that make up outwash material varies according to the velocity of the water that carried them. When fast moving water slows down, the coarser particles are deposited. Finer particles, such as very fine sand, silt, and clay, can be carried by slower moving water. Outwash deposits generally consist of layers of particles of similar size. Sandy loam, sand, gravel, and other coarse particles are dominant. The Ockley soils, for example, formed in outwash material.

Lacustrine materials were deposited from still, or ponded, glacial melt water. Because the coarser fragments dropped out of moving water as outwash, only the finer particles, such as very fine sand, silt, and clay, remained to settle out in still water. Lacustrine deposits are silty or clayey in texture. In Huntington County, the soils that formed in lacustrine deposits typically have a moderately fine textured subsoil. The Patton soils are examples.

Recent alluvial material was deposited by the floodwaters of streams. This material ranges in texture, depending on the velocity of the water from which it was deposited. The alluvial material deposited along a swift stream, such as Silver Creek, is coarser textured than the alluvium deposited along a slow, sluggish stream, such as Little River. The Eel and Genesee soils formed in alluvial material.

Organic material is made up of deposits of plant remains. After the glaciers withdrew from the area, water was left standing in lakes and depressions in outwash and till plains. Grasses and sedges growing around the edges of these lakes died, and their remains fell to the bottom. Because of wetness of the areas, the plant remains did not decompose but accumulated around the edge of the lake. Later, white-cedar and other water-tolerant trees grew on these accumulations. As these trees died, their residue became a part of the organic accumulation. The lakes were eventually filled with organic material that, subsequently, partially decomposed and developed into areas of muck and peat. The Houghton soils formed in organic material.

The parent material from which some of the soils in Huntington County are derived was weathered from dolomite or limestone bedrock. In most places, the soil directly above the bedrock was formed in residuum from the bedrock, and the upper part of the soil was formed in the glacial deposit. The Millsdale, Milton, and Randolph soils are examples.

plant and animal life

Plants have been the principal organism influencing the soils in Huntington County; however, bacteria, fungi, earthworms, and man have also been important. The chief contribution of plant and animal life is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kind of plants that grew on the soil. The remains of these plants decay and eventually become soil organic matter. Roots of the plants provide channels for downward movement of water through the soil and also add organic matter as they decay. Bacteria in the soil help to break down the organic matter so that it can be used by growing plants.

The vegetation in Huntington County was mainly deciduous forests. Differences in natural soil drainage and minor changes in parent material have affected the composition of the forest species.

Generally, the well drained upland soils, such as Morley, Rawson Variant, and Hennepin soils, were mainly covered with oak, hickory, and ash. The Blount soils were covered with maples and beech. The wet soils supported mainly cottonwood and willow. A few wet soils also had sphagnum and other mosses that contributed substantially to the accumulation of organic matter. The Pewamo and Rensselaer soils developed under wet conditions and contain considerable organic matter. The soils of Huntington County developed under dominantly forest vegetation and have less total accumulated organic matter than soils that developed under dominantly grass vegetation.

climate

Climate is important in the formation of soils. It helps to determine the kind of plant and animal life on and in the soil. It affects the amount of water available for weathering of minerals, the removal of the products of weathering, and the translocation of soil materials. Climate, through its influence on soil temperature, determines the rate of chemical reactions that occur in the soil. These influences are important, but they affect large areas rather than a relatively small area, such as a county.

The climate in Huntington County is cool and humid. It is presumably similar to that which existed when the soils formed. Climate is uniform throughout the county. For more detailed information on the climate, see the section "General nature of the county."

relief

Relief or topography has a marked influence on the soils through its relation to depth of the water table, erosion, plant cover, and soil temperature. In Huntington County slope ranges from nearly level to very steep. Depth of the water table largely determines natural soil drainage which ranges from well drained on the ridgetops to very poorly drained in the depressions.

Relief influences the formation of soils by affecting runoff and drainage; drainage in turn, through its affect on aeration of the soil, determines the color of the soil. Runoff is greater on the steeper slopes, but in low areas, water is temporarily ponded. Water and air move freely through soils that are well drained and slowly through soils that are very poorly drained. In soils that are well aerated, the iron compounds that give most soils their color are oxidized and are brightly colored. In poorly aerated soils the color is dull gray and mottled. The Morley soils are well drained and well aerated. The Pewamo soils are poorly aerated and very poorly drained.

Intermediate between the very poorly drained and well drained soils are the poorly drained, somewhat poorly drained, and moderately well drained soils.

time

Time, usually a long time, is required by the agents of soil formation to form distinct horizons in the soil from parent material. The differences in length of time that the parent materials have been in place are commonly reflected in the degree of development of the soil profile. Some soils develop rapidly, others develop slowly.

The soils in Huntington County range from young to mature. The glacial deposits from which many of the soils formed have been exposed to soil-forming factors for a long enough time to allow distinct horizons to develop within the soil profile. Some soils, however, in recent alluvial sediment have not been in place long enough for distinct horizons to develop.

The Shoals soils have weakly developed horizons and are examples of young soils formed in alluvial material. The Haskins Variant and Blount soils are older. They have more strongly developed horizons.

processes of soil formation

Several processes have been involved in the formation of the soils of this county. These processes are the accumulation of organic matter; the solution, transfer, and removal of calcium carbonates and bases; and the liberation and translocation of silicate clay minerals. In most soils, more than one of these processes have been active in horizon differentiation.

Some organic matter has accumulated in the surface layer of all of the soils. The organic matter content of some soils is low, but that of others is high. Generally, the soils that have the most organic matter, such as the Pewamo and Rensselaer soils, have a thick, black surface horizon.

Carbonates and bases have been leached from the upper horizons of nearly all the soils of the county. Leaching is generally believed to precede the translocation of silicate clay minerals. Most all of the carbonates and some of the bases have been leached from the A and B horizons of well drained soils. Even in the wettest soils, some leaching is indicated by the absence of carbonates and by an acid reaction.

Clay accumulates in pores and other voids and forms films on the surface along which water moves. Leaching of bases and translocation of silicate clays are among the more important processes in horizon differentiation in the soils of Huntington County. The Blount soils are examples in which translocated silicate clay has accumulated as clay films in the B2t horizon.

The reduction and transfer of iron, or gleying, has occurred in all of the very poorly drained and somewhat poorly drained soils. In these naturally wet soils, this process has been significant in horizon differentiation and is recognized by the gray color of the subsoil. Reduction is commonly accompanied by some transfer of the iron, either from upper horizons to lower horizons or completely out of the profile. The presence of mottles indicates the redistribution and segregation of iron.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves all or part of the crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, subsurface. Removal of excess ground water through buried drains installed within the soil profile. The drains collect the water and convey it to a gravity or pump outlet.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Surface soil. The A horizon and all subdivisions of this horizon (A1, A2, and A3).

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Underlying material. (See Substratum).

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in period 1951-74 at Huntington, Indiana]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	33.6	17.8	25.7	60	-12	10	2.28	1.01	3.30	6	6.4
February---	37.5	20.4	29.0	63	-8	12	2.02	1.06	2.79	5	7.5
March------	47.4	28.4	38.0	77	5	108	3.14	1.79	4.22	8	5.8
April------	62.1	39.6	50.9	84	19	332	3.85	2.07	5.30	9	1.8
May--------	72.3	48.8	60.6	90	29	639	4.02	2.70	5.22	9	.0
June-------	82.2	58.3	70.2	96	40	906	4.18	2.42	5.60	8	.0
July-------	85.2	62.0	73.6	97	46	1,042	3.66	2.26	4.92	7	.0
August-----	84.1	59.9	72.0	96	43	992	2.97	1.70	3.99	6	.0
September--	77.9	53.3	65.6	94	33	768	2.88	1.42	4.06	6	.0
October----	66.5	42.8	54.7	86	22	460	2.73	.86	4.21	6	.1
November---	49.6	32.7	41.2	74	10	107	2.81	1.70	3.79	7	3.2
December---	37.6	23.0	30.3	65	-6	37	2.76	1.10	4.09	6	7.0
Yearly:											
Average--	61.3	40.6	51.0	---	---	---	---	---	---	---	---
Extreme--	---	---	---	98	-14	---	---	---	---	---	---
Total----	---	---	---	---	---	5,413	37.30	32.48	41.92	83	31.8

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-74 at Huntington, Indiana]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 19	May 3	May 16
2 years in 10 later than--	April 15	April 27	May 11
5 years in 10 later than--	April 7	April 16	May 2
First freezing temperature in fall:			
1 year in 10 earlier than--	October 22	October 5	September 25
2 years in 10 earlier than--	October 27	October 10	September 30
5 years in 10 earlier than--	November 5	October 21	October 10

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-74 at Huntington, Indiana]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	192	165	145
8 years in 10	198	173	150
5 years in 10	212	187	161
2 years in 10	225	201	171
1 year in 10	231	209	176

TABLE 4.--SUITABILITY AND LIMITATION OF MAP UNITS ON THE GENERAL SOIL MAP

Map unit	Extent of area	Cultivated crops	Pasture	Woodland	Urban uses	Intensive recreation areas	Extensive recreation areas
	Pct						
1. Blount-Pewamo	62	Well suited	Well suited	Well suited	Poorly suited: wetness, percs slowly, ponding.	Poorly suited: wetness, percs slowly, ponding, erodes easily.	Well suited.
2. Morley-Blount-Pewamo	27	Suited: slope.	Well suited	Well suited	Poorly suited: slope, wetness, percs slowly, ponding.	Poorly suited: wetness, percs slowly, ponding, erodes easily, slope.	Well suited.
3 Genesee-Ockley-Fox	4	Well suited	Well suited	Well suited	Poorly suited: poor filter, flooding, slope.	Suited: flooding, slope.	Well suited.
4. Randolph-Millsdale-Milton	4	Well suited	Well suited	Well suited	Generally unsuited: wetness, ponding, percs slowly, depth to rock, slope.	Suited: wetness, ponding, percs slowly, depth to rock, slope.	Well suited.
5 Patton-Shoals-Rensselaer	2	Well suited	Well suited	Suited. ponding, wetness.	Generally unsuited: ponding, wetness, flooding, percs slowly.	Poorly suited: flooding, wetness, ponding.	Well suited.
6. Martinsville-Eel-Genesee	1	Well suited	Well suited	Well suited	Poorly suited: flooding, wetness.	Well suited.	Well suited.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
ApA	Aptakisic silt loam, 0 to 2 percent slopes	474	0.2
BcB2	Blount silt loam, 1 to 4 percent slopes, eroded	92,579	37.1
ChB	Chelsea loamy sand, 3 to 12 percent slopes	182	0.1
Ee	Eel silt loam, occasionally flooded	2,622	1.1
FoA	Fox loam, 0 to 2 percent slopes	316	0.1
FoB	Fox loam, 2 to 6 percent slopes	596	0.2
FoC2	Fox loam, 6 to 12 percent slopes, eroded	284	0.1
Ge	Genesee silt loam, occasionally flooded	2,580	1.0
GlB2	Glynwood silt loam, 3 to 7 percent slopes, eroded	11,402	4.6
HcA	Haskins Variant fine sandy loam, 1 to 4 percent slopes	1,536	0.6
HeG	Hennepin loam, 30 to 70 percent slopes	2,762	1.1
Ho	Houghton muck, drained	413	0.2
McA	Martinsville silt loam, 0 to 2 percent slopes	1,319	0.5
McB	Martinsville silt loam, 2 to 8 percent slopes	1,857	0.8
Ms	Millsdale silty clay loam	2,130	0.9
MtA	Milton silt loam, 0 to 2 percent slopes	781	0.3
MtB	Milton silt loam, 2 to 6 percent slopes	804	0.3
MtC	Milton silt loam, 6 to 15 percent slopes	311	0.1
MxC2	Morley silt loam, 6 to 12 percent slopes, eroded	13,554	5.4
MxD2	Morley silt loam, 12 to 18 percent slopes, eroded	4,063	1.6
MxE2	Morley silt loam, 18 to 30 percent slopes, eroded	1,223	0.5
MzC3	Morley clay loam, 6 to 12 percent slopes, severely eroded	2,219	0.9
MzD3	Morley clay loam, 12 to 18 percent slopes, severely eroded	1,041	0.4
OcA	Ockley loam, 0 to 2 percent slopes	1,032	0.4
OcB	Ockley loam, 2 to 6 percent slopes	336	0.1
Pa	Patton silty clay loam	2,096	0.8
Pe	Patton silty clay loam, sandy substratum	4,921	2.0
Pg	Pewamo silty clay loam	75,374	30.2
Px	Pits, gravel	187	0.1
Py	Pits, quarry	139	0.1
RcA	Randolph loam, 0 to 2 percent slopes	3,574	1.4
RgB	Rawson Variant fine sandy loam, 2 to 6 percent slopes	1,421	0.6
RgC	Rawson Variant fine sandy loam, 6 to 12 percent slopes	331	0.1
Rk	Rensselaer loam	3,050	1.2
Sh	Shoals silt loam, occasionally flooded	5,259	2.2
Sm	Sloan silt loam, frequently flooded	244	0.1
Ud	Udorthents, loamy	1,033	0.4
Wo	Whitaker loam	1,998	0.8
	Water	3,557	1.4
	Total	249,600	100.0

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
ApA: Aptakisic	115	39	51	4.4	8.4
BcB2: Blount	105	35	47	4.3	7.8
ChB: Chelsea	57	21	---	2.0	4.0
Ee: Eel	105	37	---	3.9	8.0
FoA: Fox	95	32	42	4.0	7.8
FoB: Fox	95	30	42	4.0	7.8
FoC2: Fox	90	28	38	3.6	7.2
Ge: Genesee	105	37	---	3.9	8.0
GlB2: Glynwood	104	32	40	4.2	7.6
HcA: Haskins Variant	102	36	45	4.2	7.7
HeG: Hennepin	---	---	---	---	---
Ho: Houghton	115	37	---	---	---
McA: Martinsville	120	42	48	4.0	8.0
McB: Martinsville	120	42	48	4.0	8.0
Ms: Millsdale	112	40	50	4.8	9.6
MtA: Milton	95	30	40	4.0	7.8
MtB: Milton	90	30	40	4.0	7.8
MtC: Milton	80	28	38	3.5	7.0
MxC2: Morley	100	30	40	4.2	7.5
MxD2: Morley	96	30	40	4.0	7.3
MxE2: Morley	---	---	---	3.1	6.2

See footnotes at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
MzC3, MzD3 Morley	95	29	39	3.6	7.2
OcA Ockley	110	38	44	4.0	8.0
OcB Ockley	110	38	44	4.0	8.0
Pa Patton	148	48	56	5.0	10.0
Pe Patton	140	45	52	5.0	10.0
Pg Pewamo	125	42	55	5.0	10.0
Px**, Py**. Pits					
RcA Randolph	100	34	42	4.1	7.7
RgB Rawson Variant	95	32	41	4.0	7.5
RgC Rawson Variant	85	30	35	3.7	6.9
Rk Rensselaer	150	53	60	5.0	10.0
Sh Shoals	117	41	---	4.3	8.6
Sm Sloan	110	35	---	4.0	8.0
Ud**. Udorthents					
Wo Whitaker	125	44	50	4.1	8.2

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	2,351	---	---	---
II	198,600	97,593	99,910	1,097
III	32,243	25,882	6,361	---
IV	6,464	6,282	---	182
V	---	---	---	---
VI	2,264	2,264	---	---
VII	2,762	2,762	---	---
VIII	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
ApA----------------- Aptakisic	2o	Slight	Slight	Slight	Slight	White oak-----------	80	White oak, northern red oak, green ash, eastern white pine, sugar maple.
						Northern red oak----	80	
BcB2---------------- Blount	3o	Slight	Slight	Slight	Slight	White oak-----------	65	Eastern white pine, red pine, yellow-poplar.
						Northern red oak----	65	
						Green ash-----------	---	
						Bur oak-------------	---	
						Pin oak-------------	---	
ChB----------------- Chelsea	3s	Slight	Slight	Moderate	Slight	White oak-----------	70	Eastern white pine, red pine, jack pine.
						Red pine------------	72	
						Eastern white pine--	83	
						Jack pine-----------	70	
						Quaking aspen-------	72	
						Northern red oak----	70	
Ee------------------ Eel	1o	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	Eastern white pine, black walnut, yellow-poplar.
						Eastern cottonwood--	---	
						White ash-----------	---	
						Black walnut--------	---	
FoA, FoB, FoC2------ Fox	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Yellow-poplar, white ash, eastern white pine, red pine.
						White oak-----------	---	
						Sugar maple---------	---	
Ge------------------ Genesee	1o	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	Eastern white pine, black walnut, yellow-poplar.
GlB2---------------- Glynwood	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine, yellow-poplar, black walnut, white ash.
						Black oak-----------	80	
						White oak-----------	80	
						Black walnut--------	---	
HcA----------------- Haskins Variant	2o	Slight	Slight	Slight	Slight	White oak-----------	75	Red maple, white ash, eastern white pine, yellow-poplar.
						Northern red oak----	80	
						Pin oak-------------	90	
HeG----------------- Hennepin	1r	Severe	Severe	Slight	Slight	Northern red oak----	85	Northern red oak, white oak, green ash, black walnut, eastern white pine, red pine.
						White oak-----------	---	
Ho------------------ Houghton	4w	Slight	Severe	Severe	Severe	White ash-----------	51	
						Red maple-----------	51	
						Quaking aspen-------	56	
						Black willow--------	---	
						Silver maple--------	76	
McA, McB------------ Martinsville	1o	Slight	Slight	Slight	Slight	White oak-----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
Ms: Millsdale	2w	Slight	Severe	Severe	Severe	Pin oak Red maple Eastern cottonwood Black cherry Green ash Swamp white oak	86 --- --- --- --- ---	Red maple, American sycamore, eastern cottonwood, pin oak, green ash, swamp white oak.
MtA, MtB, MtC: Milton	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Black walnut Black cherry White oak White ash Sugar maple	80 95 --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, northern red oak, white oak.
MxC2, MxD2: Morley	2o	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Black walnut Bur oak Northern red oak Shagbark hickory Bur oak	80 80 90 --- --- --- --- ---	White oak, black walnut, green ash, eastern white pine, red pine.
MxE2: Morley	2r	Moderate	Moderate	Slight	Slight	White oak Northern red oak Yellow-poplar Black walnut Bur oak Northern red oak Shagbark hickory Bur oak	80 80 90 --- --- --- --- ---	White oak, black walnut, green ash, eastern white pine, red pine.
MzC3, MzD3: Morley	2o	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Black walnut Bur oak Northern red oak Shagbark hickory Bur oak	80 80 90 --- --- --- --- ---	White oak, black walnut, green ash, eastern white pine, red pine.
OcA, OcB: Ockley	1o	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar	90 90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Pa: Patton	2w	Slight	Severe	Moderate	Moderate	Pin oak White oak Northern red oak	85 75 75	Eastern white pine, red maple, white ash.
Pe: Patton	2w	Slight	Severe	Moderate	Moderate	Pin oak White oak Northern red oak	85 75 75	White ash, red maple, eastern white pine.
Pg: Pewamo	2w	Slight	Severe	Severe	Severe	Pin oak Swamp white oak Red maple White ash Eastern cottonwood Green ash	90 --- 71 71 98 ---	White ash, eastern white pine, red maple, green ash.
RcA: Randolph	3o	Slight	Slight	Slight	Slight	Northern red oak Sugar maple Yellow-poplar	75 90 85	Eastern white pine, yellow-poplar.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
RgB, RgC: Rawson Variant	2o	Slight	Slight	Slight	Slight	White oak Northern red oak	75 80	Eastern white pine, yellow-poplar, black walnut.
Rk: Rensselaer	2w	Slight	Severe	Severe	Severe	Pin oak White oak Northern red oak	86 75 76	Eastern white pine, red maple, white ash.
Sh: Shoals	2o	Slight	Slight	Slight	Slight	Pin oak Yellow-poplar Virginia pine Eastern cottonwood White ash	90 90 90 --- ---	Red maple, swamp chestnut oak, pin oak, yellow-poplar.
Sm: Sloan	2w	Slight	Severe	Severe	Severe	Pin oak Swamp white oak Red maple Green ash Eastern cottonwood	86 --- --- --- ---	Red maple, white ash, eastern cottonwood, Austrian pine, pin oak, swamp white oak.
Wo: Whitaker	3o	Slight	Slight	Slight	Slight	White oak Pin oak Yellow-poplar Northern red oak	70 85 85 75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
ApA: Aptakisic	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Pin oak, eastern white pine.
BcB2: Blount	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
ChB: Chelsea	Siberian peashrub	Radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Austrian pine, jack pine, red pine.	Eastern white pine	---
Ee: Eel	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
FoA, FoB, FoC2: Fox	Siberian peashrub	Autumn-olive, Amur honeysuckle, radiant crabapple, Washington hawthorn, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
Ge: Genesee	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
GlB2: Glynwood	---	Amur honeysuckle, Washington hawthorn, Amur privet, arrowwood, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Pin oak, eastern white pine.	---
HcA: Haskins Variant	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
HeG---------------- Hennepin	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine.
Ho----------------- Houghton	Common ninebark, whitebelle honeysuckle.	Amur honeysuckle, Amur privet, silky dogwood, nannyberry viburnum, Tatarian honeysuckle.	Tall purple willow	Golden willow, black willow.	Imperial Carolina poplar.
McA, McB---------- Martinsville	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Ms----------------- Millsdale	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, Washington hawthorn.	Eastern white pine	---
MtA, MtB, MtC----- Milton	Siberian peashrub	Radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
MxC2, MxD2-------- Morley	---	Amur honeysuckle, Washington hawthorn, Amur privet, arrowwood, American cranberrybush, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Pin oak-----------	---
MxE2. Morley					
MzC3, MzD3-------- Morley	---	Amur honeysuckle, Washington hawthorn, Amur privet, arrowwood, American cranberrybush, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Pin oak-----------	---
OcA, OcB---------- Ockley	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Pa: Patton	---	Amur privet, silky dogwood, American cranberrybush, Amur honeysuckle.	White fir, northern white-cedar, blue spruce, Austrian pine, Washington hawthorn, Norway spruce.	Eastern white pine	Pin oak.
Pe: Patton	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Pg: Pewamo	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Px*, Py*. Pits					
RcA: Randolph	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine.
RgB, RgC: Rawson Variant	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Northern white-cedar, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
Rk: Rensselaer	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Sh: Shoals	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Sm: Sloan	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Ud*. Udorthents					

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Wo----------------- Whitaker	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, Austrian pine, blue spruce, Washington hawthorn, northern white-cedar.	Norway spruce-----	Eastern white pine, pin oak.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
ApA: Aptakisic	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
BcB2: Blount	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
ChB: Chelsea	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Ee: Eel	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
FoA: Fox	Slight	Slight	Moderate: small stones.	Slight	Slight.
FoB: Fox	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
FoC2: Fox	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Ge: Genesee	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
GlB2: Glynwood	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: wetness, slope, percs slowly.	Moderate: wetness.	Slight.
HcA: Haskins Variant	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
HeG: Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ho: Houghton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.
McA: Martinsville	Slight	Slight	Slight	Slight	Slight.
McB: Martinsville	Slight	Slight	Moderate: slope.	Slight	Slight.
Ms: Millsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MtA: Milton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: thin layer.
MtB: Milton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Slight	Moderate: thin layer.
MtC: Milton	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope, thin layer.
MxC2, MxD2: Morley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
MxE2: Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
MzC3, MzD3: Morley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
OcA: Ockley	Slight	Slight	Slight	Slight	Slight.
OcB: Ockley	Slight	Slight	Moderate: slope.	Slight	Slight.
Pa: Patton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pe: Patton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pg: Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Px*, Py*. Pits					
RcA: Randolph	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, thin layer.
RgB: Rawson Variant	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
RgC: Rawson Variant	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Rk: Rensselaer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Sh: Shoals	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
Sm: Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Ud*. Udorthents					
Wo: Whitaker	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
ApA----- Aptakisic	Good	Good	Good	Good	Fair	Fair	Poor	Good	Good	Poor.
BcB2----- Blount	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ChB----- Chelsea	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Ee----- Eel	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
FoA, FoB, FoC2----- Fox	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ge----- Genesee	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
GlB2----- Glynwood	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HcA----- Haskins Variant	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HeG----- Hennepin	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
Ho----- Houghton	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
McA, McB----- Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ms----- Millsdale	Fair	Fair	Fair	Fair	Poor	Good	Fair	Fair	Fair	Fair.
MtA, MtB----- Milton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MtC----- Milton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MxC2, MxD2----- Morley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MxE2----- Morley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MzC3, MzD3----- Morley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
OcA, OcB----- Ockley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor
Pa, Pe----- Patton	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Pg----- Pewamo	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Px*, Py*. Pits										

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
RcA Randolph	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RgB Rawson Variant	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
RgC Rawson Variant	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Rk Rensselaer	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Sh Shoals	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Sm Sloan	Fair	Fair	Good	Poor	Poor	Good	Good	Fair	Poor	Good.
Ud*. Udorthents										
Wo Whitaker	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ApA: Aptakisic	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
BcB2: Blount	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
ChB: Chelsea	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Ee: Eel	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
FoA: Fox	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
FoB: Fox	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
FoC2: Fox	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
Ge: Genesee	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
GlB2: Glynwood	Severe: wetness.	Moderate. wetness, shrink-swell.	Severe: wetness.	Moderate: slope, shrink-swell, wetness.	Severe: frost action, low strength.	Slight.
HcA: Haskins Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
HeG: Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ho: Houghton	Severe: ponding, excess humus.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength, frost action.	Severe: excess humus, ponding.
McA: Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
McB: Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
Ms: Millsdale	Severe: depth to rock, ponding.	Severe: ponding.	Severe: ponding, depth to rock.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
MtA: Milton	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: low strength.	Moderate: thin layer.
MtB: Milton	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.	Moderate: thin layer.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
MtC: Milton	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
MxC2, MxD2: Morley	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
MxE2: Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
MzC3, MzD3: Morley	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
OcA: Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
OcB: Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Pa: Patton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Pe: Patton	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Pg: Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Px*, Py*. Pits						
RcA: Randolph	Severe: depth to rock, wetness.	Severe: wetness.	Severe: depth to rock, wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness, thin layer.
RgB: Rawson Variant	Moderate: wetness.	Slight	Moderate: wetness.	Moderate: slope.	Moderate: frost action.	Slight.
RgC: Rawson Variant	Moderate: wetness, slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Rk: Rensselaer	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Sh: Shoals	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
Sm: Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Ud*. Udorthents						

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Wo----------------- Whitaker	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ApA------------------ Aptakisic	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
BcB2----------------- Blount	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
ChB------------------ Chelsea	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
Ee------------------- Eel	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
FoA, FoB------------- Fox	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
FoC2----------------- Fox	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Ge------------------- Genesee	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
GlB2----------------- Glynwood	Severe: percs slowly, wetness.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
HcA------------------ Haskins Variant	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
HeG------------------ Hennepin	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ho------------------- Houghton	Severe: ponding, percs slowly.	Severe: seepage, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
McA------------------ Martinsville	Slight-----------	Moderate: seepage.	Moderate: too clayey.	Slight-----------	Fair: too clayey, thin layer.
McB------------------ Martinsville	Slight-----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey, thin layer.
Ms------------------- Millsdale	Severe: depth to rock, ponding, percs slowly.	Severe: depth to rock, ponding.	Severe: depth to rock, ponding, too clayey.	Severe: depth to rock, ponding.	Poor: too clayey, area reclaim, hard to pack.
MtA, MtB------------- Milton	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MtC----------------- Milton	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
MxC2, MxD2---------- Morley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
MxE2---------------- Morley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MzC3, MzD3---------- Morley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
OcA, OcB------------ Ockley	Slight-----------	Severe: seepage.	Severe: seepage.	Slight-----------	Poor: small stones.
Pa------------------ Patton	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Pe------------------ Patton	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Pg------------------ Pewamo	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, ponding, hard to pack.
Px*, Py*. Pits					
RcA----------------- Randolph	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too clayey.	Severe: wetness, depth to rock.	Poor: too clayey, area reclaim, hard to pack.
RgB----------------- Rawson Variant	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Slight-----------	Fair: wetness.
RgC----------------- Rawson Variant	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, slope.	Moderate: slope.	Fair: slope, wetness.
Rk------------------ Rensselaer	Severe: ponding.	Severe: ponding.	Severe: ponding, too sandy.	Severe: ponding.	Poor: too sandy, ponding.
Sh------------------ Shoals	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Sm------------------ Sloan	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Ud*. Udorthents					
Wo------------------ Whitaker	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ApA: Aptakisic	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
BcB2: Blount	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
ChB: Chelsea	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Ee: Eel	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
FoA, FoB, FoC2: Fox	Good	Probable	Probable	Poor: small stones, area reclaim.
Ge: Genesee	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
GlB2: Glynwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
HcA: Haskins Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
HeG: Hennepin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ho: Houghton	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: wetness, excess humus.
McA, McB: Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ms: Millsdale	Poor: low strength, area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, thin layer.
MtA, MtB, MtC: Milton	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MxC2, MxD2: Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, too clayey.
MxE2: Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope, too clayey.
MzC3, MzD3: Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, too clayey.
OcA, OcB: Ockley	Good	Probable	Probable	Poor: small stones, area reclaim.
Pa: Patton	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Pe: Patton	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey.
Pg: Pewamo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey.
Px*, Py*. Pits				
RcA: Randolph	Poor: low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, too clayey.
RgB: Rawson Variant	Fair: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
RgC: Rawson Variant	Fair: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Rk: Rensselaer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Sh: Shoals	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Sm: Sloan	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ud*. Udorthents				
Wo: Whitaker	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
ApA: Aptakisic	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
BcB2: Blount	Moderate: slope.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily.
ChB: Chelsea	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
Ee: Eel	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily.
FoA, FoB: Fox	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy	Rooting depth.
FoC2: Fox	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, rooting depth.
Ge: Genesee	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
GlB2: Glynwood	Moderate: slope.	Moderate: wetness, piping.	Severe: no water.	Slope, percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
HcA: Haskins Variant	Moderate: seepage.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, soil blowing, percs slowly.	Wetness, percs slowly.
HeG: Hennepin	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, droughty, percs slowly.
Ho: Houghton	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Frost action, subsides, ponding.	Ponding, soil blowing.	Wetness.
McA: Martinsville	Moderate: seepage.	Severe: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
McB: Martinsville	Moderate: seepage, slope.	Severe: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Ms: Millsdale	Moderate: depth to rock.	Severe: ponding, thin layer.	Severe: no water.	Depth to rock, frost action, ponding.	Depth to rock, ponding.	Wetness, depth to rock.
MtA: Milton	Moderate: depth to rock.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock, erodes easily.	Erodes easily, depth to rock.
MtB: Milton	Moderate: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock, erodes easily.	Erodes easily, depth to rock.
MtC: Milton	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
MxC2, MxD2, MxE2, MzC3, MzD3------- Morley	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
OcA---------------- Ockley	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
OcB---------------- Ockley	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Pa----------------- Patton	Slight---------	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding--------	Wetness.
Pe----------------- Patton	Slight---------	Severe: ponding.	Severe: slow refill, cutbanks cave.	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
Pg----------------- Pewamo	Slight---------	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding--------	Wetness.
Px*, Py*. Pits						
RcA---------------- Randolph	Moderate: depth to rock.	Severe: thin layer.	Severe: no water.	Depth to rock, frost action.	Depth to rock, wetness, erodes easily.	Wetness, depth to rock, erodes easily.
RgB---------------- Rawson Variant	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, soil blowing.	Erodes easily, percs slowly.
RgC---------------- Rawson Variant	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily, soil blowing.	Slope, erodes easily, percs slowly.
Rk----------------- Rensselaer	Moderate: seepage.	Severe: piping, ponding.	Severe: cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding, too sandy.	Wetness.
Sh----------------- Shoals	Moderate: seepage.	Severe: wetness, piping.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Sm----------------- Sloan	Slight---------	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Ud*. Udorthents						
Wo----------------- Whitaker	Moderate: seepage.	Severe: wetness.	Moderate: slow refill, cutbanks cave.	Frost action, cutbanks cave.	Erodes easily, wetness.	Wetness, erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ApA------ Aptakisic	0-9	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	95-100	95-100	80-100	25-40	5-15
	9-34	Silty clay loam	CL, CH	A-7, A-6	0	100	100	95-100	60-100	35-55	20-40
	34-60	Stratified fine sandy loam to silt loam.	ML, CL, SM, SC	A-2, A-4	0	95-100	95-100	90-100	30-90	20-30	NP-10
BcB2------ Blount	0-8	Silt loam--------	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	8-24	Silty clay loam, silty clay, clay loam.	CH, CL	A-7, A-6	0-5	95-100	90-100	90-100	80-95	35-60	15-35
	24-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	90-100	90-100	80-100	70-90	30-45	10-25
ChB------ Chelsea	0-7	Loamy sand-------	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
	7-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
Ee------ Eel	0-7	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	75-85	26-40	3-15
	7-13	Silt loam, loam	ML, CL	A-4, A-6	0	100	100	90-100	75-85	26-40	3-15
	13-60	Stratified sandy loam to silty clay loam.	ML, CL	A-4, A-6	0	100	90-100	70-80	55-70	26-40	3-15
FoA, FoB, FoC2--- Fox	0-8	Loam-------------	ML, CL, CL-ML	A-4	0	95-100	85-100	75-95	55-90	20-30	3-10
	8-30	Gravelly clay loam, loam, gravelly sandy clay loam.	CL, SC	A-2, A-6, A-7	0-5	85-100	70-95	50-95	20-65	25-45	10-25
	30-60	Stratified sand to gravel.	SP, SM, GP, GM	A-1, A-2, A-3	0-10	40-100	35-100	15-95	2-20	---	NP
Ge------ Genesee	0-18	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	75-90	26-40	3-15
	18-25	Silt loam, loam	ML, CL	A-4, A-6	0	100	100	90-100	75-90	26-40	3-15
	25-60	Stratified sandy loam to silt loam.	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	60-90	50-90	20-35	3-15
GlB2------ Glynwood	0-7	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	90-100	80-100	55-90	23-40	4-15
	7-30	Clay, clay loam, silty clay loam.	CL, CH	A-7, A-6	0-5	95-100	85-100	75-100	65-95	35-55	15-30
	30-60	Clay loam, silty clay loam.	CL	A-6, A-4	0-5	95-100	80-100	75-95	65-90	25-40	7-18
HcA------ Haskins Variant	0-10	Fine sandy loam	SM, SM-SC, SC	A-4	0	95-100	90-100	60-85	35-55	<25	NP-7
	10-31	Sandy loam, loam	SC, CL	A-4, A-2-4, A-6	0	95-100	90-100	50-95	25-75	20-30	7-12
	31-60	Clay loam, silty clay loam.	CL	A-6	0-5	95-100	95-100	85-100	65-95	30-40	10-15
HeG------ Hennepin	0-5	Loam-------------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	70-100	60-95	25-40	5-20
	5-14	Loam, sandy loam, silt loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
	14-60	Loam, sandy loam, clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
Ho------ Houghton	0-60	Sapric material	Pt	A-8	0	---	---	---	---	---	---
McA, McB--------- Martinsville	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-90	22-33	4-12
	8-31	Clay loam, loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	90-100	65-90	40-90	20-35	8-20
	31-47	Sandy loam, sandy clay loam, loam.	SM, ML	A-2-4, A-4	0	100	90-100	60-80	30-60	30-40	2-8
	47-60	Stratified sand to sandy clay loam.	CL, SC, CL-ML, SM-SC	A-4	0	95-100	85-100	80-95	40-60	<25	4-9

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ms---------------- Millsdale	0-14	Silty clay loam	CL	A-6, A-7	0	90-100	80-100	75-100	60-95	32-50	12-25
	14-25	Clay, channery silty clay loam, silty clay loam.	CH, CL	A-7	0-5	85-100	80-100	75-100	60-95	40-60	20-35
	25	Unweathered bedrock.									
MtA, MtB, MtC----- Milton	0-7	Silt loam--------	ML, CL	A-4, A-6	0	95-100	90-100	85-100	70-95	26-36	4-12
	7-13	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0	95-100	80-100	75-100	70-95	32-48	12-28
	13-24	Clay, sandy clay loam, channery clay loam.	CH, CL	A-7, A-6	0-5	95-100	80-100	70-95	50-90	32-55	14-33
	24	Unweathered bedrock.									
MxC2, MxD2, MxE2- Morley	0-7	Silt loam--------	CL, CL-ML	A-6, A-4	0-5	95-100	95-100	90-100	75-95	25-40	5-15
	7-28	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
	28-60	Silty clay loam, clay loam.	CL, CH	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-60	15-30
MzC3, MzD3-------- Morley	0-4	Clay loam--------	CL	A-6, A-7	0-5	95-100	90-100	85-95	80-90	30-45	15-25
	4-25	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
	25-60	Silty clay loam, clay loam.	CL, CH	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-60	15-30
OcA, OcB---------- Ockley	0-8	Loam-------------	CL, ML, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	3-12
	8-40	Fine sandy loam, clay loam, sandy loam.	CL, CL-ML, ML, SM	A-6, A-4 A-2	0	100	75-100	45-100	20-80	15-40	3-15
	40-55	Gravelly clay loam, gravelly sandy clay loam.	CL, SC, GC	A-6, A-7	0-2	70-85	45-75	40-70	35-55	30-50	15-30
	55-60	Stratified sand to gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	5-20	2-10	---	NP
Pa---------------- Patton	0-8	Silty clay loam	CL	A-6	0	100	100	95-100	75-95	30-40	15-25
	8-44	Silty clay loam	CL, CH, ML, MH	A-7	0	100	100	95-100	80-100	40-55	15-25
	44-60	Stratified loam to silty clay loam.	CL	A-6	0	100	100	95-100	75-95	25-40	10-20
Pe---------------- Patton	0-18	Silty clay loam	CL	A-6	0	100	100	95-100	75-100	30-40	10-20
	18-47	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	80-100	30-45	10-25
	47-60	Stratified fine sand to clay loam.	ML, CL, SM, SC	A-4, A-6, A-2-4, A-2-6	0	100	95-100	60-100	20-80	<35	NP-15
Pg---------------- Pewamo	0-12	Silty clay loam	CL	A-6, A-7	0-5	90-100	80-100	80-100	70-90	35-50	15-25
	12-36	Clay loam, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	95-100	90-100	90-100	75-95	35-55	15-30
	36-60	Clay loam, silty clay loam.	CL	A-7	0-5	95-100	90-100	90-100	70-90	40-50	15-25
Px*, Py*. Pits											

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
RcA---------------- Randolph	0-15	Loam--------------	CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	75-85	20-38	4-15
	15-25	Clay, silty clay, clay loam.	CL, CH	A-7, A-6	0-5	75-95	75-95	75-85	70-80	38-74	14-42
	25	Unweathered bedrock.									
RgB, RgC---------- Rawson Variant	0-10	Fine sandy loam	SM, SM-SC, SC	A-4	0	95-100	90-100	60-85	35-55	<25	NP-7
	10-35	Fine sandy loam, sandy loam.	SM, SM-SC, SC	A-4, A-2-4	0	95-100	90-100	50-85	25-55	<25	NP-7
	35-60	Clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	95-100	85-100	65-95	30-40	10-16
Rk---------------- Rensselaer	0-14	Loam--------------	CL, ML	A-4, A-6	0	100	100	90-100	70-90	27-36	4-12
	14-37	Clay loam, silty clay loam, silt loam.	CL	A-6, A-7	0	95-100	90-100	80-100	60-80	25-40	11-16
	37-46	Sandy clay loam, loam.	CL, SC	A-6	0	95-100	90-100	75-95	35-75	25-35	11-16
	46-60	Stratified fine sand to clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-2	0	95-100	90-100	60-95	20-70	<30	4-9
Sh---------------- Shoals	0-8	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-90	20-35	6-15
	8-23	Silt loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-85	25-40	5-15
	23-60	Stratified silt loam to gravelly sandy loam.	ML, CL, CL-ML	A-4	0-3	90-100	85-100	60-80	50-70	<30	4-10
Sm---------------- Sloan	0-14	Silt loam---------	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	14-34	Silty clay loam, loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	34-60	Stratified gravelly sandy loam to silty clay loam.	ML, CL	A-4, A-6	0	95-100	70-100	60-95	50-90	25-40	3-15
Ud*. Udorthents											
Wo---------------- Whitaker	0-7	Loam--------------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	4-12
	7-37	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	70-80	30-47	12-26
	37-60	Stratified coarse sand to clay.	CL, SC, ML, SM	A-4	0	98-100	98-100	60-85	40-60	15-25	3-9

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
ApA-------------	0-9	20-27	1.15-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	5	1-3
Aptakisic	9-34	27-35	1.35-1.55	0.6-2.0	0.18-0.20	5.1-7.8	Moderate-----	0.37			
	34-60	10-25	1.40-1.60	0.6-2.0	0.14-0.22	6.1-8.4	Low----------	0.37			
BcB2------------	0-8	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.43	3	6	1-3
Blount	8-24	35-50	1.40-1.70	0.06-0.2	0.12-0.19	4.5-7.8	Moderate-----	0.43			
	24-60	27-38	1.60-1.85	0.06-0.2	0.07-0.10	7.4-8.4	Moderate-----	0.43			
ChB-------------	0-7	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low----------	0.17	5	2	.5-1
Chelsea	7-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-8.4	Low----------	0.17			
Ee--------------	0-7	18-27	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.8	Low----------	0.37	5	5	1-3
Eel	7-13	18-27	1.30-1.50	0.6-2.0	0.17-0.22	6.1-8.4	Low----------	0.37			
	13-60	10-27	1.30-1.50	0.6-2.0	0.19-0.21	6.6-8.4	Low----------	0.37			
FoA, FoB, FoC2---	0-8	10-17	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.32	4	5	1-3
Fox	8-30	25-35	1.55-1.65	0.6-2.0	0.15-0.19	5.6-8.4	Moderate-----	0.32			
	30-60	0-2	1.30-2.20	>6.0	0.02-0.04	7.4-8.4	Low----------	0.10			
Ge--------------	0-18	18-27	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.8	Low----------	0.37	5	5	1-3
Genesee	18-25	18-27	1.30-1.50	0.6-2.0	0.17-0.22	6.1-8.4	Low----------	0.37			
	25-60	10-20	1.30-1.50	0.6-2.0	0.19-0.21	7.4-8.4	Low----------	0.37			
GlB2------------	0-7	16-27	1.25-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.43	3	6	1-3
Glynwood	7-30	35-55	1.45-1.75	0.06-0.2	0.11-0.18	4.5-7.8	Moderate-----	0.32			
	30-60	27-36	1.65-1.85	0.06-0.2	0.06-0.10	7.4-8.4	Moderate-----	0.32			
HcA-------------	0-10	5-18	1.30-1.45	0.6-2.0	0.13-0.15	6.1-7.3	Low----------	0.24	4	3	1-3
Haskins Variant	10-31	17-26	1.40-1.55	0.6-2.0	0.13-0.17	5.6-7.3	Low----------	0.32			
	31-60	28-35	1.60-1.80	0.06-0.2	0.13-0.17	6.6-8.4	Moderate-----	0.32			
HeG-------------	0-5	20-30	1.20-1.40	0.6-2.0	0.18-0.24	6.1-7.8	Low----------	0.32	4	5	1-4
Hennepin	5-14	18-30	1.30-1.60	0.2-0.6	0.14-0.22	6.1-7.8	Low----------	0.32			
	14-60	18-30	1.45-1.70	0.2-0.6	0.07-0.11	6.1-8.4	Low----------	0.32			
Ho--------------	0-60	---	0.15-0.45	0.2-6.0	0.35-0.45	5.6-7.8	-------------	----	---	1	>70
Houghton											
McA, McB--------	0-8	8-17	1.30-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.37	5	5	1-3
Martinsville	8-31	18-30	1.40-1.60	0.6-2.0	0.17-0.20	5.1-6.0	Moderate-----	0.37			
	31-47	10-25	1.40-1.60	0.6-2.0	0.12-0.14	5.1-6.5	Low----------	0.24			
	47-60	3-23	1.50-1.70	0.6-2.0	0.19-0.21	5.1-8.4	Low----------	0.24			
Ms--------------	0-14	27-32	1.30-1.50	0.6-2.0	0.19-0.22	6.1-7.3	Moderate-----	0.32	4	6	4-7
Millsdale	14-25	35-45	1.40-1.70	0.2-0.6	0.12-0.16	6.1-8.4	Moderate-----	0.32			
	25	---	---	---	---	---	-------------	----			
MtA, MtB, MtC----	0-7	14-27	1.30-1.50	0.6-2.0	0.18-0.23	5.1-7.3	Low----------	0.37	4	6	1-3
Milton	7-13	35-50	1.45-1.70	0.2-0.6	0.12-0.18	4.5-7.8	Moderate-----	0.37			
	13-24	25-45	1.40-1.70	0.2-0.6	0.12-0.16	6.1-7.8	Moderate-----	0.37			
	24	---	---	---	---	---	-------------	----			
MxC2, MxD2, MxE2-	0-7	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-6.5	Low----------	0.43	3	6	1-3
Morley	7-28	35-50	1.45-1.65	0.06-0.2	0.18-0.20	5.1-7.8	Moderate-----	0.43			
	28-60	27-36	1.60-1.80	0.06-0.2	0.07-0.12	6.1-8.4	Moderate-----	0.43			
MzC3, MzD3-------	0-4	27-35	1.40-1.60	0.2-0.6	0.18-0.22	5.1-6.5	Moderate-----	0.43	2	7	1-3
Morley	4-25	35-50	1.45-1.65	0.06-0.2	0.18-0.20	5.1-7.8	Moderate-----	0.43			
	25-60	27-36	1.60-1.80	0.06-0.2	0.07-0.12	6.1-8.4	Moderate-----	0.43			

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
OcA, OcB--------- Ockley	0-8	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-6.5	Low-----------	0.37	5	5	.5-3
	8-40	10-35	1.45-1.60	0.6-2.0	0.15-0.20	4.5-6.0	Moderate------	0.37			
	40-55	20-35	1.40-1.55	0.6-2.0	0.12-0.14	5.6-7.3	Moderate------	0.24			
	55-60	2-5	1.60-1.80	>20	0.02-0.04	7.4-8.4	Low-----------	0.10			
Pa--------------- Patton	0-8	27-35	1.15-1.35	0.6-2.0	0.21-0.23	6.6-7.3	Moderate------	0.28	5	7	3-5
	8-44	27-35	1.25-1.45	0.2-0.6	0.18-0.20	6.1-7.8	Moderate------	0.28			
	44-60	22-35	1.30-1.50	0.2-0.6	0.18-0.22	7.4-8.4	Moderate------	0.28			
Pe--------------- Patton	0-18	27-35	1.15-1.35	0.6-2.0	0.20-0.22	5.6-7.3	Moderate------	0.28	5	7	4-6
	18-47	27-35	1.25-1.45	0.2-0.6	0.18-0.20	6.1-7.3	Moderate------	0.43			
	47-60	3-30	1.20-1.50	0.2-0.6	0.06-0.14	7.4-8.4	Moderate------	0.28			
Pg--------------- Pewamo	0-12	27-40	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.3	Moderate------	0.24	5	6	3-5
	12-36	35-50	1.40-1.70	0.2-0.6	0.12-0.20	5.6-7.8	Moderate------	0.24			
	36-60	30-40	1.50-1.75	0.2-0.6	0.14-0.18	7.4-8.4	Moderate------	0.24			
Px*, Py* Pits											
RcA-------------- Randolph	0-15	16-27	1.30-1.45	0.6-2.0	0.17-0.22	5.1-7.3	Low-----------	0.37	4	6	1-3
	15-25	35-50	1.40-1.70	0.2-0.6	0.13-0.16	5.1-7.8	Moderate------	0.37			
	25	---	---	---	---	---	--------------	----			
RgB, RgC--------- Rawson Variant	0-10	5-18	1.30-1.45	0.6-2.0	0.13-0.15	5.6-7.3	Low-----------	0.24	4	3	1-3
	10-35	5-18	1.40-1.55	0.6-2.0	0.13-0.15	5.1-6.5	Low-----------	0.24			
	35-60	28-36	1.60-1.80	0.06-0.2	0.13-0.17	6.6-8.4	Moderate------	0.37			
Rk--------------- Rensselaer	0-14	18-27	1.30-1.45	0.2-0.6	0.20-0.24	6.1-7.3	Low-----------	0.28	5	5	2-6
	14-37	20-35	1.40-1.60	0.6-2.0	0.15-0.19	6.1-7.3	Moderate------	0.28			
	37-46	20-35	1.40-1.60	0.6-2.0	0.16-0.18	6.6-7.8	Moderate------	0.28			
	46-60	2-30	1.50-1.70	0.6-2.0	0.19-0.21	7.9-8.4	Low-----------	0.28			
Sh--------------- Shoals	0-8	18-27	1.30-1.50	0.6-2.0	0.22-0.24	6.1-7.8	Low-----------	0.37	5	5	2-5
	8-23	18-32	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.8	Low-----------	0.37			
	23-60	12-25	1.35-1.60	0.6-2.0	0.12-0.21	6.6-7.3	Low-----------	0.28			
Sm--------------- Sloan	0-14	15-27	1.20-1.40	0.6-2.0	0.20-0.24	6.1-7.8	Low-----------	0.28	5	6	3-6
	14-34	22-35	1.25-1.55	0.2-0.6	0.15-0.19	6.1-8.4	Moderate------	0.37			
	34-60	10-30	1.20-1.50	0.2-0.6	0.13-0.18	6.6-8.4	Low-----------	0.37			
Ud*. Udorthents											
Wo--------------- Whitaker	0-7	8-17	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	5	5	1-3
	7-37	18-30	1.40-1.60	0.6-2.0	0.15-0.19	5.1-6.0	Moderate------	0.37			
	37-60	3-18	1.50-1.70	0.6-2.0	0.19-0.21	6.6-8.4	Low-----------	0.37			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
ApA---------------- Aptakisic	C	None---------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High------	High------	Moderate.
BcB2--------------- Blount	C	None---------	---	---	1.0-3.0	Perched	Jan-May	>60	---	High------	High------	Moderate.
ChB---------------- Chelsea	A	None---------	---	---	>6.0	---	---	>60	---	Low-------	Low-------	Low.
Ee----------------- Eel	C	Occasional	Brief------	Oct-Jun	3.0-6.0	Apparent	Jan-Apr	>60	---	High------	Moderate	Low.
FoA, FoB, FoC2----- Fox	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low-------	Moderate.
Ge----------------- Genesee	B	Occasional	Brief------	Oct-Jun	>6.0	---	---	>60	---	Moderate	Low-------	Low.
GlB2--------------- Glynwood	C	None---------	---	---	2.0-3.5	Perched	Jan-Apr	>60	---	High------	High------	Moderate.
HcA---------------- Haskins Variant	C	None---------	---	---	1.0-2.5	Perched	Jan-Apr	>60	---	High------	High------	Moderate.
HeG---------------- Hennepin	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low-------	Low.
Ho*---------------- Houghton	A/D	None---------	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	High------	High------	Low.
McA, McB----------- Martinsville	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Ms*---------------- Millsdale	B/D	None---------	---	---	+1-1.0	Perched	Jan-Apr	20-40	Hard	High------	High------	Low.
MtA, MtB, MtC------ Milton	C	None---------	---	---	>6.0	---	---	20-40	Hard	Moderate	High------	Moderate.
MxC2, MxD2, MxE2, MzC3, MzD3-------- Morley	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High------	Moderate.
OcA, OcB----------- Ockley	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Pa*---------------- Patton	B/D	None---------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High------	High------	Low.
Pe*---------------- Patton	B/D	None---------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High------	High------	Low.

See footnotes at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Pg*: Pewamo	C/D	None	---	---	+1-1.0	Apparent	Dec-May	>60	---	High	High	Low.
Px**, Py**. Pits												
RcA: Randolph	D	None	---	---	1.0-2.5	Perched	Jan-Apr	20-40	Hard	High	High	Moderate.
RgB, RgC: Rawson Variant	B	None	---	---	3.0-6.0	Perched	Jan-Apr	>60	---	Moderate	Low	Moderate.
Rk*: Rensselaer	B/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High	High	Low.
Sh: Shoals	C	Occasional	Brief	Oct-Jun	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Low.
Sm: Sloan	B/D	Frequent	Brief	Oct-Jun	0-1.0	Apparent	Nov-Jun	>60	---	High	High	Low.
Ud**. Udorthents												
Wo: Whitaker	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.

* In the "High water table--Depth" column, a plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Aptakisic	Fine-silty, mixed, mesic Aeric Ochraqualfs
Blount	Fine, illitic, mesic Aeric Ochraqualfs
Chelsea	Mixed, mesic Alfic Udipsamments
Eel	Fine-loamy, mixed, nonacid, mesic Aquic Udifluvents
Fox	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Genesee	Fine-loamy, mixed, nonacid, mesic Typic Udifluvents
Glynwood	Fine, illitic, mesic Aquic Hapludalfs
Haskins Variant	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Hennepin	Fine-loamy, mixed, mesic Typic Eutrochrepts
Houghton	Euic, mesic Typic Medisaprists
*Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Millsdale	Fine, mixed, mesic Typic Argiaquolls
Milton	Fine, mixed, mesic Typic Hapludalfs
Morley	Fine, illitic, mesic Typic Hapludalfs
*Ockley	Fine-loamy, mixed, mesic Typic Hapludalfs
Patton	Fine-silty, mixed, mesic Typic Haplaquolls
*Pewamo	Fine, mixed, mesic Typic Argiaquolls
Randolph	Fine, mixed, mesic Aeric Ochraqualfs
Rawson Variant	Coarse-loamy, mixed, mesic Typic Hapludalf
Rensselaer	Fine-loamy, mixed, mesic Typic Argiaquolls
Shoals	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Udorthents	Loamy, mixed, mesic Udorthents
Whitaker	Fine-loamy, mixed, mesic Aeric Ochraqualfs

*The soil is a taxadjunct to the series. See text for description of those characteristics of the soil that are outside the range of the series.

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